Volume 01

GPISD Multi-Use Facility

GPISD Project #: 1001

CSP#: 25-603

GALENA PARK INDEPENDENT SCHOOL DISTRICT

GPISD
FACILITY PLANNING
AND CONSTRUCTION

Proposal Checklist

Project:	GPISD Multi-Use Facility
Project #:	1001
Total Project Budget:	$26,960,000
Pre-Proposal Conference:	Galena Park ISD Administration Building 14705 Woodforest Blvd, Houston, TX 77015 October 9, 2025 at 10:00 AM Attendance is highly recommended.
Proposal Opening Location:	Galena Park ISD Administration Building 14705 Woodforest Blvd, Houston, TX 77015
Proposal Deadline:	October 28, 2025, Base at 2:00 PM C/T Alternates at 3:00 PM C/T

Items Due 5 Business Days Prior to Proposal Opening – October 21, 2025

Pre-Proposal Information (See attribute 6 for additional information)

- ☐ OSHA (Occupational Safety & Health Administration) inspection logs for the last 3 years, a loss analysis from the Offeror's insurance carrier, & a loss history covering all lines of insurance coverage carried by the Offeror.
- ☐ Qualification Statement (AIA Document A305).
- ☐ A list of at least five (5) projects of similar scope as the project being proposed of which have been completed in the last five (5) years.
- ☐ Contractor's Proposed Project Personnel.

Items Due at Bid Time – October 28, 2025 Base at 2:00 PM C/T Alternates at 3:00 PM C/T

Bid Package including:

- ☐ Bid Bond/Proposal Bond (10%)
- ☐ Response to Sections 1 - 20
- ☐ Respond to All Bid Lines
- ☐ Respond to All Alternate Bid Lines
- ☐ Unit Prices
- ☐ Subcontractor Listing
- ☐ Small Business Enterprise Program (SBEP)
- ☐ Contractor Information

Bid Attachments

- ☐ Request for Taxpayer Identification Number and Certification W9
- ☐ Conflict of Interest Questionnaire
- ☐ Certificate of Interested Parties Form 1295
- ☐ State and Federal Certification Forms
- ☐ Certification of Criminal History Record Information

Contract Documents [provided for Proposal Preparation, does not need to be submitted with proposal]

Table of Contents

Base Proposal **27 Pages**

Base Proposal Information Page 1
Proposal Attributes Page 3

1. Introduction
2. Submission Response
3. Communications Statement
4. Attachments Required
5. Proposal Opening
6. Submission Required PRIOR to Proposal Opening
7. Instructions to Proposers for Contracts for Construction
8. Project Information
9. Proposal Acknowledgement
10. Proposal Bond for Building Construction Contracts
11. Proposal Phase Procedures
12. Felony Conviction Notice
13. Affidavit of Non-Collusion
14. Certificate of Residency
15. Verification of Business Type
16. Conflict of Interest Questionnaire
17. Contractor's Proposed Project Personnel
18. Antitrust Certification Statement
19. Form 1295 – Certificate of Interested Parties
20. Contract Documents Deviations and Exceptions

Proposal Lines **Page 25**
Alternate Proposal Lines **Page 5**
Unit Prices **Page 8**
Subcontractor Listing Page 20
Small Business Enterprise Program Page 26
Contractor Information Page 27

Base Bid Attachments **28 Pages**

Request for Taxpayer Identification Number and Certification
Conflict of Interest Questionnaire
Certificate of Interested Parties Form 1295
State and Federal Certification Form
Certification of Criminal History Record Information

Sample Construction Documents **31 Pages**

Standard form of Agreement between Owner and Contractor for Building Construction Contracts
Instructions for Performance and Payment Bonds
General Conditions of the Contract for Construction
Supplementary Conditions to the General Conditions of the Contract for Construction
Special Conditions of the Contract for Construction

Base Proposal Information

CSP #	25-603
Project:	Galena Park ISD Multi-Use Facility
Type:	Competitive Sealed Proposal
Issue Date:	October 5, 2025
Question Deadline:	October 21, 2025
Response Deadline:	October 28, 2025

25-603 **PROPOSAL** Close Date and Time: Tuesday, October 28, 2025

Galena Park Independent School District (GPISD) is requesting **Competitive Sealed Proposals (CSP** 25-603**)** for Galena Park ISD Multi-Use Facility **(GPISD Project** 1001**)**. **Proposals are due on October 28, 2025, Base at 2:00 PM C/T & Alternates at 3:00 PM C/T,** after which proposals will be opened publicly and read aloud at the GPISD Administration Building. Submissions must be delivered to the **Facilities Planning and Construction Department** in the GPISD Administration Building, 14705 Woodforest Blvd., Houston, TX 77015, in a sealed envelope by the close date and time stated in this Proposal event. A Proposal Security in the amount of ten percent (10%) of the proposal amount is required.

The scope of work includes Ground up Multi-Use Facility with Weight-Room, and Existing Fieldhouse Renovation.

A pre-proposal conference will be held at the **GPISD Administration Building**, on **Thursday, October 9, 2025,** Attendance is highly recommended.

Proposal Documents will be available on October 5, 2025 on the district website, and on the GPISD eBid system https://galenaparkisd.ionwave.net.

GPISD reserves the right to reject any and all proposals, the right to negotiate with any proposers after submission of proposals, and at its discretion, may waive any formalities or minor irregularities regarding the proposals.

Ship To Information

Address: Facilities Planning and Construction Department
Galena Park ISD Administration Building
14705 Woodforest Blvd.
Houston, TX 77015
Phone: (832) 386-1020
Email: capitalprojects@galenaparkisd.com

Billing Information

Address: Accounts Payable
Galena Park ISD Administration Building
14705 Woodforest Blvd.
Houston, TX 77015
Phone: (832) 386-1025
Fax: (832) 386-1428
Email: accounts_payable@galenaparkisd.com

Activities

Pre-Proposal Conference	October 9, 2025 at 10:00 AM
Pre-Proposal Information Due	October 21, 2025
Response to Questions Due	October 23, 2025
Board of Trustee Meeting	November 10, 2025
Contract Execution	November 11, 2025
Owner Receives Bonds and Insurance	November 17, 2025
Notice to Proceed	November 24, 2025
Substantial Completion	August 1, 2027
Final Completion	August 1, 2028

Proposal Attributes

1. Introduction

There are attributes, including this one, associated with this proposal. Some are notes and require no response, but most have a required response.

2. Submission Response

Please ensure that you respond to all Proposal Attributes and Line Items. Manual submissions must be delivered to the Facilities Planning and Construction Department, in a sealed envelope by the close date and time stated in this Proposal event. No fax or email submissions will be accepted. Manual submission shall consist of one (1) original hard copy and one (1) electronic flash drive. For any questions, please contact the Facilities Planning and Construction Department at capitalprojects@galenaparkisd.com.

3. Communications Statement

Contact between vendors and Galena Park ISD personnel during the proposal process or evaluation process is prohibited. Any attempt by vendors during the proposal process to contact district personnel may result in disqualification. All communication shall go through the Facilities Planning and Construction Department during this competitive process. All questions received and the corresponding answers will be distributed to all Proposers. No verbal responses will be provided. The deadline for questions about this proposal is stated in the Proposal Activities and the district will not respond to questions after this time and date. Response to questions will be posted in the ebid system and on Addenda. The vendors will be responsible for checking the ebid system for any posted responses.

4. Attachments Required

Be sure to submit all required documents and forms.

5. Proposal Opening

Any proposal received later than the specified time, whether delivered in person or by any other method shall be disqualified. Any questions pertaining to the proposal procedures should be addressed to the Facilities Planning and Construction Department at capitalprojects@galenaparkisd.com. If the District office location where proposals are to be submitted is closed due to inclement weather, natural disaster, or for any other cause including if the electronic Proposal system is unavailable on the due date, the deadline for submission shall be extended until the next District business day, unless the Proposer is otherwise notified by the District. The time of day for submission shall remain the same.

6. Submission Required PRIOR to Proposal Opening

The following forms are required **5 days prior to the proposal opening**:

- OSHA (Occupational Safety and Health Administration) inspection logs for the last three years, a loss analysis from the Proposer's insurance carrier, and a loss history covering all lines of insurance coverage carried by the Proposer.
- Qualification Statement (AIA Document A305).
- A list of at least five (5) projects of similar scope as the project being proposed of which have been completed in the last five (5) years.
- Contractor's Proposed Project Personnel.

Proposer Qualification Statements are the primary vehicle used by the project evaluation members to assess the credentials of the Proposer with respect to evaluation criteria set forth in the Project Manual leading to the recommendation for award of Contract.

In order to receive full consideration during the proposal evaluation period, each Proposer must submit a completed Qualification Statement (AIA Document A305) to the Architect and Owner.

Forms should be submitted to **BOTH** the Architect/Engineer at **tquong@vlkarchitects.com** and to the GPISD Facilities Department at **facilities@galenaparkisd.com**

7. Instructions to Proposers for Contracts for Construction

ARTICLE 1. DEFINITIONS

1.0 Definitions set forth in the GPISD General Conditions of the Contract for Construction, or in other Proposal Documents, are applicable to the Proposal Documents.

1.1 Proposal Documents: Advertisement for Competitive Sealed Proposals, Instructions to Proposers, Proposal Security, Proposal Form, Felony Conviction Notice, Affidavit of Non-collusion, Certificate of Residency, the Drawings and the Project Manual.

1.2 Sub-proposer: A person or entity who submits a proposal to a Proposer for materials, equipment or labor for a portion of the Work.

1.3 Addenda: Written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Proposal Documents by additions, deletions, clarifications or corrections.

1.4 Proposal: A complete and properly signed Proposal to do the Work for the sums stipulated therein, submitted in accordance with the Proposal Documents.

1.5 Base Proposal: The sum stated in the Proposal for which the Proposer offers to perform the Work described in the Proposal Documents as the Base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Proposals.

1.6 Alternate Proposal (or Alternate): An amount stated in the Proposal to be added to, or deducted from, the amount of the Base Proposal if the corresponding change in the Work, as described in the Proposal, is accepted by the Owner.

1.7 Unit Price: An amount stated in the Proposal as a price per unit of measurement to add or delete for labor, materials, and equipment or services or a portion of the Work as described in the Proposal Documents.

1.8 Proposer: A person or entity who submits a Proposal. Proposer, contractor, and General Contractor shall have the same meaning and be interchangeable.

1.9 Safety Record: A proposer's OSHA (Occupational Safety and Health Administration) inspection logs for the last three years, a loss analysis from the Proposer's insurance carrier, and a loss history covering all lines of insurance coverage carried by the proposer.

1.10 Architect/Engineer: the term determines that architect/engineer shall have the same meaning and be interchangeable.

1.11 Bid Bond/Proposal Bond/Proposal Security: shall have the same meaning and be interchangeable.

ARTICLE 2. PROPOSER'S REPRESENTATIONS

2.1 The Proposer by making a Proposal represents that:

2.1.1 The Proposer has read and understands the Proposal Documents and the Proposal is made in accordance therewith.

2.1.2 The Proposer has visited the site; has become familiar with local conditions under which the Work is to be performed; and has correlated the Proposer's personal observations with the requirements of the Proposal Documents.

2.1.3 The Proposal is based upon the materials, equipment and systems required by the Proposal Contract Documents without exception.

ARTICLE 3. PROPOSAL DOCUMENTS

3.1 Copies

3.1.1 Proposers may obtain complete sets of the Proposal Documents from the issuing office designated in the Advertisement for Sealed Proposals in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Proposers who return the Documents to the issuing office in good condition and in good order within ten days after proposal opening. The cost of replacement of missing or damaged Documents will be deducted from the deposit. A Proposer receiving a Contract award may retain the Documents and the Proposer's deposit will be refunded.

3.1.2 Proposal Documents will not be issued for deposit directly to Sub-proposers or others unless specifically offered in the Advertisement for Sealed Proposals, or in the Instructions to Proposers.

3.1.3 Additional complete sets of Proposal Documents, if available, may be obtained by Proposers and Sub- proposers from the issuing office for the cost of reproduction and mailing, which costs are not refundable. It shall be understood by entities obtaining additional sets and paying the reproduction and mailing costs that such additional sets remain the Owner's exclusive property and shall be returned to the office from where the Proposal Documents were issued.

3.1.4 Proposal Documents will also be issued to plan rooms in those cities which are likely to be home locations of Proposers and Sub-proposers.

3.1.5 Proposers shall use complete sets of Proposal Documents in preparing Proposals; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

3.1.6 In making copies of the Proposal Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Proposals on the Work; and do not confer a license or grant permission for any other use of the Proposal Documents.

3.2 Interpretation or Correction of Proposal Documents

3.2.1 The Proposer shall carefully study and compare the Proposal Documents with each other, and with other work being proposed concurrently or presently under construction to the extent that it relates to the Work for which the Proposal is submitted; shall examine the site and local conditions; and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

3.2.2 Proposers and Sub-proposers requiring clarification or interpretation of the Proposal Documents shall make a written request which shall reach the Architect at least 10 working days prior to the date for receipt of Proposals.

3.2.3 Interpretations, corrections and changes of the Proposal Documents will be made by addendum. Interpretations, corrections and changes of the Proposal Documents made in any other manner will not be binding, and Proposers shall not rely upon them.

3.3 Substitutions

3.3.1 The materials, products and equipment described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

3.3.2 No substitution will be considered prior to receipt of Proposals unless a written request for approval has been received by the Architect at least ten days prior to the date for receipt of Proposals. Such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work (including changes in the work of other contracts that incorporation of the proposed substitution would require) shall be included. The burden of proof of the merit of the proposed substitution is upon the Proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

3.3.3 If the Architect approves a proposed substitution prior to receipt of Proposals, such approval will be set forth in an Addendum. Proposers shall not rely upon approvals made in any other manner.

3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Proposal Documents.

3.4 Addenda

3.4.1 Addenda will be mailed, faxed or Contractor shall pick up to those known by the issuing office to have received a complete set of Proposal Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Proposal Documents are on file for that purpose.

3.4.3 Each Proposer shall ascertain prior to submitting a Proposal that the Proposer has received all Addenda issued; and the Proposer shall acknowledge their receipt on the Proposal Form.

3.4.4 Additional complete sets of Proposal Documents, if available, may be obtained by Proposers and Sub- proposers from the issuing office for the cost of reproduction and mailing, which costs are not refundable. It shall be understood by entities obtaining additional sets and paying the reproduction and mailing costs that such additional sets remain the Owner's exclusive property and shall be returned to the office from where the Proposal Documents were issued.

3.4.5 Proposal Documents will also be issued to plan rooms in those cities which are likely to be home locations of Proposers and Sub-proposers.

3.4.6 Proposers shall use complete sets of Proposal Documents in preparing Proposals; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

3.4.7 In making copies of the Proposal Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Proposals on the Work; and do not confer a license or grant permission for any other use of the Proposal Documents.

3.5 Interpretation or Correction of Proposal Documents

3.5.1 The Proposer shall carefully study and compare the Proposal Documents with each other, and with other work being proposed concurrently or presently under construction to the extent that it relates to the Work for which the Proposal is submitted; shall examine the site and local conditions; and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

3.5.2 Proposers and Sub-proposers requiring clarification or interpretation of the Proposal Documents shall make a written request which shall reach the Architect at least 10 working days prior to the date for receipt of Proposals.

3.5.3 Interpretations, corrections and changes of the Proposal Documents will be made by addendum. Interpretations, corrections and changes of the Proposal Documents made in any other manner will not be binding, and Proposers shall not rely upon them.

3.6 Substitutions

3.6.1 The materials, products and equipment described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

3.6.2 No substitution will be considered prior to receipt of Proposals unless a written request for approval has been received by the Architect at least ten days prior to the date for receipt of Proposals. Such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work (including changes in the work of other contracts that incorporation of the proposed substitution would require) shall be included. The burden of proof of the merit of the proposed substitution is upon the Proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

3.6.3 If the Architect approves a proposed substitution prior to receipt of Proposals, such approval will be set forth in an Addendum. Proposers shall not rely upon approvals made in any other manner.

3.6.4 No substitutions will be considered after the Contract award unless specifically provided for in the Proposal Documents.

3.7 Addenda

3.7.1 Addenda will be mailed, faxed or Contractor shall pick up to those known by the issuing office to have received a complete set of Proposal Documents.

3.7.2 Copies of Addenda will be made available for inspection wherever Proposal Documents are on file for that purpose.

3.7.3 Each Proposer shall ascertain prior to submitting a Proposal that the Proposer has received all Addenda issued; and the Proposer shall acknowledge their receipt on the Proposal Form.

ARTICLE 4. PROPOSAL PROCEDURES

4.1 Form and Style of Proposals

4.1.1 Proposals shall be submitted on forms included with the Proposal Documents.

4.1.2 All blanks on the Proposal Form shall be filled in electronically or manually in ink.

4.1.3 Where so indicated by the makeup of the Proposal Form, sums shall be expressed in both words and figures, and in cases of discrepancy between the two, the amount written in words shall govern.

4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Proposal.

4.1.5 All requested Alternates shall be proposed. If no change in the Base Proposal is required, enter "No Change."

4.1.6 Where two or more Proposals for designated portions of the Work have been requested, the Proposer may, without forfeiture of the proposal security, state the Proposer's refusal to accept award of less than the combination of Proposals stipulated by the Proposer. The Proposer shall make no additional stipulations on the Proposal Form nor qualify the Proposal in any other manner.

4.1.7 Each copy of the Proposal shall include the legal name of the Proposer and a statement that the Proposer is a sole proprietor, partnership, corporation or other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Proposer to a contract. A Proposal by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Proposal submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Proposer.

4.1.8 To be considered complete, the Proposal shall include the following attributes, line items and/or forms completely and accurately filled out and executed:

- Proposal (including Unit Prices and Alternate Proposals if applicable)
- Proposal Bond - 10%
- Felony Conviction Notice
- Affidavit of Non-Collusion
- Certificate of Residency
- Verification of Business Type
- Conflict of Interest Questionnaire
- Contractor's Proposed Project Personnel
- Antitrust Certification Statement
- Form 1295 – Certificate of Interested Parties
- Contract Documents Deviations and Exceptions
- Request for Taxpayer Identification Number and Certification (W9_
- Conflict of Interest Questionnaire (form)
- Certificate of Interested Parties Form 1295 (form)
- State and Federal Certification Form
- Certification of Criminal History Record Information
- Subcontractor Listing

4.1.9 For additional proposal information and requirements refer to the following:

Proposal Phase Procedures
Contractor Proposed Project Personnel

4.2 Proposal Bond and Insurance

4.2.1 If so stipulated in the Advertisement for Sealed Proposals, or the Instructions to Proposers, each Proposal shall be accompanied by a Proposal Security in the form and amount required, pledging that the Proposer will enter into a Contract with the Owner on the terms stated in the Proposal and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Proposer refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the Proposal Security shall be forfeited to the Owner as liquidated damages, not as a penalty.

4.2.2 If a Proposal Bond is required it may be written on the Owner's standard form, a copy of which is included with the Proposal Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

4.2.3 The Owner will have the right to retain the Proposal Security of Proposers to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Proposals may be withdrawn, or (c) all Proposals have been rejected.

4.2.4 The Proposer shall provide the required insurance prior to the issuing of the Notice to Proceed. Should the Proposer fail to furnish such Insurance, the amount of the Proposal Security shall be forfeited to the Owner as liquidated damages, not as a penalty.

4.3 Submission of Proposals

4.3.1 All copies of the Proposal, the Proposal Security, if any, and other documents required to be submitted with the Proposal shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Proposals and shall be identified with the Project Name, the Owner's Project Number, the Proposer's name and address and if applicable, the designated portion of the Work for which the Proposal is submitted, If the Proposal is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED PROPOSAL ENCLOSED" on the face thereof.

4.3.2 Proposals shall be deposited at the designated location prior to the time and date for receipt of Proposals. Proposals received after the time and date for receipt of Proposals will be returned unopened.

4.3.3 The Proposer shall assume full responsibility for timely delivery at the location designated for receipt of Proposals.

4.3.4 Oral, telephonic, telegraphic Proposals or revisions noted on the outside of the sealed opaque envelope are invalid and will not receive consideration.

4.4 Modification or Withdrawal of Proposal.

4.4.1 A Proposal may not be modified, withdrawn or canceled by the Proposer for a period of sixty (60) calendar days following the time and date designated for the receipt of Proposals, and each Proposer so agrees in submitting a Proposal.

4.4.2 Prior to the time and date designated for receipt of Proposals, a Proposal submitted may be modified or withdrawn by notice to the party receiving Proposals at the place designated for receipt of Proposals. Such notice shall be in writing over the signature of the Proposer or by telegram. If by telegram, written confirmation over the signature of the Proposer shall be mailed and postmarked on or before the date and time set for receipt of Proposals. A change shall be so worded as not to reveal the amount of the original Proposal.

4.4.3 Withdrawn Proposals may be resubmitted up to the date and time designated for the receipt of Proposals provided that they are then fully in conformance with these Instructions to Proposers.

4.4.4 Proposal Security, if required, shall be in an amount sufficient for the Proposal as modified or resubmitted.

ARTICLE 5. PRE & POST PROPOSAL INFORMATION

5.1 Submittals

5.1.1 Upon request by the Owner, Proposers shall provide the following:
.1 a designation of the Work to be performed with the Proposer's own forces;
.2 names of the manufacturers, products and the suppliers of principal items or systems of materials and equipment proposed for the Work; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

5.1.2 The Proposer will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Proposal Documents.

5.1.3 Prior to the award of the Contract, the Architect will notify the Proposer in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Proposer. If the Owner or Architect has reasonable objection to a proposed person or entity, the Proposer may at the Proposer's option (1) withdraw the Proposal, or (2) submit an acceptable substitute person or entity with an adjustment in the Base Proposal or Alternate Proposal to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted proposal price or disqualify the Proposer. In the event of either withdrawal or disqualification, Proposal Security will not be forfeited.

5.1.4 Persons and entities proposed by the Proposer, and to whom the Owner and Architect have made no reasonable objection, must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 6. CONSIDERATION OF PROPOSALS

6.1 Opening of Proposals

6.1.1 Unless stated otherwise in the Advertisement for Sealed Proposals, the properly identified Proposals received on time will be opened publicly and will be read aloud. An abstract of the Proposals will be made available to Proposers.

6.2 Rejection of Proposals

6.2.1 The Owner shall have the right to reject any or all Proposals, reject a Proposal not accompanied by a required Proposal Security or by other data required by the Proposal Documents, or reject a Proposal which is in any way incomplete or irregular.

6.3 Acceptance of Proposals (Award)

6.3.1 It is the intent of the Owner to award a Contract to the Proposer deemed to be in the best interests of Galena Park I.S.D. provided the Proposal has been submitted in accordance with the requirements of the Proposal Documents and does not exceed the funds available. The Owner shall have the right to waive informalities or irregularities in a Proposal received and to accept the Proposal which, in the Owner's judgment, is in the Owner's own best interests.

6.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Proposal Documents, and to determine the low Proposer on the basis of the sum of the Base Proposal and Alternates accepted.

6.4 The Owner will use the following criteria with respect to evaluating the proposals:

Criteria	Percent
Purchase Price (Line Items)	40
Reputation, quality, and long-term value to the Owner (Warranty) of the Proposer's goods and services, and safety record of the proposer. (Exhibit A, B, C, D & E - A305 and References)	20
Qualifications of the Proposers proposed project team (Proposed Project Personnel Attribute, Qualification Statement, & Exhibit C - A305)	10
Qualifications and reputation of the Proposer's proposed subcontractors (Subcontractor Listing Line Item)	15
Proposed Schedule	10
Small Business Participation Commitment	5

ARTICLE 7. PERFORMANCE AND PAYMENT BONDS

7.1 Bond Requirements

7.1.1 If stipulated in the Proposal Documents, the Proposer shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Proposer's usual sources.

7.1.2 If the furnishing of such bonds is stipulated in the Proposal Documents, the cost shall be included in the Proposal.

7.2 Time of Delivery and Form of Bonds

7.2.1 The Proposer shall deliver the required bonds to the Owner not later than ten days following the date of execution of the Contract.

7.2.2 Unless otherwise provided, the bonds shall be written on the Owner's standard forms for performance and payment bonds, copies of which are included in the Proposal Documents. Both bonds shall be written in the amount of the Contract Sum.

7.2.3 The bonds shall be dated on or after the date of the Contract.

7.2.4 The Proposer 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.

ARTICLE 8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 Form to be used

8.1.1 The Agreement for the Work will be written on the Owner's standard form of agreement, a copy of which is included in the Proposal Documents.

8. PROJECT INFORMATION

Project:	**Galena Park ISD Multi-Use Facility**
Project Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**
Total Project Budget:	**$26,960,000**
Substantial Completion Date:	**August 1, 2027**

The Architect/Engineer is:	**VLK Architects**
	20445 State Highway 249; Suite 350; Houston, Texas 77070
Contact Name:	**Tam Quong**
Contact Email:	**tquong@vlkarchitects.com**

9. PROPOSAL ACKNOWLEDGEMENT

Having carefully examined the Proposal Documents for the Project and all Addenda thereto, as well as the site of the proposed Work and all the conditions affecting the Work, the undersigned proposes to furnish all labor, materials, services and equipment necessary to complete the entire Work in accordance with the Proposal Documents for the sums submitted on the Proposal Lines tab.

BASE PROPOSAL: The undersigned agrees to perform all work required by the Proposal Documents which is not specifically indicated to be proposed as an Alternate.

ALTERNATE PROPOSALS: If the Owner elects to require increases, decreases or changes in the Work specifically described in the Proposal Documents as Alternates, the undersigned agrees to perform such increases, decreases or changes for the sums stated below. The undersigned also understands that the Owner reserves the right to accept or reject any alternate proposal in the order of its choosing and to suit available funding.

The undersigned further agrees, if awarded the Contract, to complete all work required by the Proposal Documents in the number of calendar days after Notice to Proceed or by the specific date stipulated in the Proposal Documents.

The undersigned further agrees that the Proposal Security, payable to the Board of Trustees of the Galena Park Independent School District, accompanying this proposal is left in escrow with the Chief Finance Officer of the Galena Park Independent School District; that its amount is measure of the liquidated damages which the Owner will sustain by the failure of the undersigned to execute and deliver the above named Agreement and Bonds, and that if the undersigned defaults in executing that Agreement or in furnishing the Performance and Payment Bonds or insurance certificates within the stipulated time period following the written notification of the award of the Contract, then the check shall become the property of the Owner, or the Proposal Bond shall become subject to forfeiture to the Owner.

It is understood that the Owner reserves the right to accept or reject any and all Proposals and to waive formalities or irregularities as it deems to serve its best interests. It is further agreed that this Proposal shall be valid and not withdrawn within a period of sixty (60) days from the date of opening thereof. Withdrawal of Proposal within the stipulated sixty-day period may result in the forfeiture of the Proposal Security.

The work to be performed under this Contract shall be commenced within ten (10) days from the date of the Notice to Proceed issued by the Owner and the Contractor shall achieve Substantial Completion within the time stipulated in the Supplementary Conditions of the Contract, subject to adjustments of this Contract Time as provided elsewhere in the Proposal Documents. The time set forth for completion of the Work is an essential element of the Contract.

10. PROPOSAL BOND FOR BUILDING CONSTRUCTION CONTRACTS

Proposal Bond for Building Construction Contracts

A. Each individual Proposal package submitted must be accompanied by Bid Bond made payable to Owner in an amount of ten percent (10%) of the Proposal price (for Proposal bond purposes, the Proposal price shall include the base Proposal, plus all alternates; however, the Contract price shall be as awarded by Galena Park Independent School District). Proposal Bond shall be in the form of a Cashier's Check or a Proposal Bond, duly executed by proposer as principal and having as surety thereon, a corporate surety company duly authorized and admitted to do business in the State of Texas and licensed by the State of Texas to issue such bond, as a guarantee that the proposer will enter into a Contract and execute required Performance and Payment Bonds within ten (10) days of Galena Park Independent School District award of Contract.

B. Each Proposal must be accompanied by information establishing that the agent signing the bond is authorized to write the bond in the amount requested, and if applicable, that reinsurance requirements, have been met, including limits and ratings or other evidence of company solvency.

C. Proposer must demonstrate to Owner that he can secure required bonds, issued by a corporate surety company authorized and admitted to do business in the State of Texas and licensed in the State of Texas to issue such bond, which bonds shall be written in the form contained in the Project Manual without modification.

11. PROPOSAL PHASE PROCEDURES

Proposer Qualification Statements
Conditions of the Contract, Supplementary Conditions and Division 1 Apply to this section.

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section contains procedures to be followed by general contractor proposers and sub-contractors / material suppliers during the proposal phase of the project.

1.2 RELATED WORK

A. All sections of specifications contained in the Project Manual.
B. All drawings issued as Contract Documents
C. All Addenda issued during the proposal phase.

1.3 SUBMITTALS

A. Qualification Statements
B. Project Lists
C. References

1.4 QUALITY ASSURANCE

A. The Proposer's Qualification Statement, including accompanying documents, is the primary tool used in the Competitive Sealed Proposal evaluation process. It is the Proposer's opportunity to demonstrate their strengths and qualifications.
B. It is the Proposer's sole responsibility to provide complete information on all required submittal documents.
C. It is the Proposer's sole responsibility to provide reference information that is current, accurate and viable; in that the references submitted shall respond.
    01 Evaluation requests for reference input shall be distributed to references by fax or email.
    02 No attempt shall be made by the Architect to correct inaccurate information submitted by the Proposer.
    03 Non-responses from Proposer's references shall have a negative impact on the Proposer in the evaluation process.
D. It is the Proposer's sole responsibility to provide Qualification Statement, including accompanying documents in a timely manner to allow ample time for reference inquiries and responses, and other evaluation processes.
    01 No attempt shall be made by the Architect to expedite responses from references submitted by the Proposer.
    02 Non-responses from Proposer's references shall have a negative impact on the Proposer in the evaluation process.

PART 2 – PROCEDURES

2.1 PROPOSER QUALIFICATION STATEMENTS

A. Proposer Qualification Statements are the primary vehicle used by the project evaluation members to assess the credentials of the Proposer with respect to evaluation criteria set forth in the Project Manual leading to the recommendation for award of Contract.
    01 It is the sole responsibility of the Proposer to assure the information provided as reference is accurate, current, useful and verifiable.
B. In order to receive full consideration during the proposal evaluation period, each Proposer

must submit a completed Qualification Statement (AIA Document A305) to the Architect and Owner according to the "Submission Required PRIOR to Proposal Opening" attribute.

01 Qualification Statements received after the "Submission Required PRIOR to Proposal Opening" deadline shall be accepted and processed; however, the proposer shall bear any / all consequences of a less than adequate evaluation due to a late submission.

02 Fax submissions will not be accepted.

C. In addition to the information required in AIA A305 Qualification Statement, each proposer shall submit the following specific information attached to the Qualification Statement:

01 A list of at least five (5) projects of similar scope as the project being proposed on which have been completed in the last five (5) years. Referenced projects to include the following information:

a. Project Name and Location
b. Project Completion Date
c. Final Project Cost
d. Owner's Name and Contact Information (current phone number, fax number, and email address.).
e. Architect's Project Manager Name and Contact Information (current phone number and fax number).

02 A list of at least five (5) references of Owners and five (5) Architects which the proposer has completed work for in the last five (5) years including the following information:

a. Name and Contact Information (current phone number, and email address).

03 A list of all projects completed in the last three (3) years including the following information:

a. Project Name and Location
b. Project Completion Date
c. Final Project Cost
d. Owner's Name and Contact Information (current phone no.).
e. Architect's Project Manager Name and Contact Information (current phone no.).

D. Any other information the Proposer wishes to submit to be used in the evaluation process.

2.2 ELECTRONIC AVAILABILITY OF PROPOSAL DOCUMENTS

A. Proposal documents – drawings, specifications and addenda – shall be posted on the GPISD website at https://www.galenaparkisd.com/Page/1155 and ionwave.

B. Proposal documents – drawings, specifications and addenda – shall be posted in the following plan rooms:
isqft.com and virtualbx.com

2.3 PROPOSAL PHASE - REQUEST FOR INFORMATION

A. All Requests For Information (RFI) during the Proposal Phase should be made in writing (email preferred). Requests by telephone shall be accepted only at the discretion of the recipient.

B. Proposal RFI's should be made directly to the responsible party/consultant per the project information attribute.

C. All Proposal RFI's shall be responded to in writing by return fax or email only to the original sender.

D. Official changes to the Contract Documents originating from Proposal RFI's shall be issued by Addendum

2.4 ADDENDA

A. All Addenda shall be issued by the Architect/Engineer on record.
B. Generally, each Addendum shall be limited to a single discipline (Architectural, MEP, Civil, Structural, etc.), containing only Contract Document changes relative to that discipline.
C. All Addenda shall be issued and posted to the district website at https://www.galenaparkisd.com/Page/1155.

12. FELONY CONVICTION NOTICE

Felony Conviction Notice

State of Texas Legislative Senate Bill No.1, Section 44.034, Notification of Criminal History, Subsection (a), states “A person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony.” Subsection (b) states “A school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract.” Is your firm owned or operated by anyone who has been convicted of a felony?

Subsection (c) states, “This notice is not required of a publicly held corporation.”

- ☐ My firm is publicly held corporation; therefore, this reporting requirement is not applicable.
- ☐ My firm is not owned or operated by anyone who has been convicted of a felony.
- ☐ My firm is owned or operated by the following individual(s) who has/have been convicted of a felony

(Required: Check only one)

Felony Conviction Details

If your firm is owned or operated by anyone who has been convicted of a felony, please list

- name(s)
- date(s) of conviction(s)
- details of the conviction(s)

If not applicable, please enter N/A (not applicable).

13. AFFIDAVIT OF NON-COLLUSION

Anti-Collusion Statement

The undersigned affirms that they are duly authorized to execute this proposal, that this company, corporation, firm, partnership or individual has not prepared this proposal in collusion with any other proposer, and that the contents of this proposal as to prices, terms or conditions of said proposal 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 proposal.

☐ I agree.

14. CERTIFICATE OF RESIDENCY

Certificate of Residency
The State of Texas has passed a law concerning non-resident contractors. This law makes it necessary for the Galena Park Independent School District to determine the residency of its proposers. This law can be found in Vernon's Annotated Civil Statutes as Article 601g, Sections 1 and 2. It reads:

"Section 1 (a) (2) "Non-resident Proposer means a Proposer whose principal place of business is not in this state but excludes a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

"Section 1 (a) (3) "Texas resident Proposer means a Proposer whose principal place of business is in this state and includes a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

“Section 1(b) The state or governmental agency of the state may not award a contract for general construction, improvements, services, or public works projects or purchases of supplies materials or equipment to a non-resident Proposer unless the non-resident's Proposal is lower than the lowest Proposal submitted by a responsible Texas resident Proposer by the same amount that a Texas resident Proposer would be required to underbid a non-resident Proposer to obtain a comparable contract in the state in which the non-resident's principal place of business is located."

Please select one of the following:
(Required: Check only one)

- ☐ My company is a Resident Proposer
- ☐ My company is a Nonresident Proposer

Certificate of Residency

Enter the **city** and **state** of the principal place of business (under Article 601g).

_____

_____

_____

_____

15. VERIFICATION OF BUSINESS TYPE

Verification of Business Type
(Required: Check only one)

- ☐ Sole Proprietor
- ☐ Partnership
- ☐ Corporation (provide state of incorporation)
- ☐ Other (provide detail in next attribute)

Verification of Business Type

Provide state of incorporation or additional details if applicable

16. CONFLICT OF INTEREST QUESTIONNAIRE

Conflict of Interest Questionnaire

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session. Instructions on filling out this form are included in the Proposal invitation.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section176.006(a-1), Local Government Code.

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

Local government officers:

Board of Trustees & Superintendent of Schools

Name	**Position**
Ramon Garza	President
Linda Clark Sherrard	Vice President
Jose Jimenez	Secretary
Adrian Stephens	Board Trustee
Noe Esparza	Board Trustee
Norma Hernandez	Board Trustee
Amanda Erebia	Board Trustee
Dr. John C. Moore	Superintendent of Schools

Does this vendor have a conflict of interest with Galena Park Independent School District?
(Required: Check only one).

- ☐ Yes
- ☐ No

17. CONTRACTOR'S PROPOSED PROJECT PERSONNEL

Contractor's Proposed Project Personnel
An item of the evaluation criteria used to select the successful general contractor to perform this work is the qualifications of the Contractor's project team proposed to be assigned to this project. Please submit the names of the personnel in the spaces provided.

Principal in Charge

_____

_____

Project Manager

_____

_____

Assistant Project Manager (as applicable)

_____

_____

Construction Superintendent

_____

_____

Assistant Superintendent (as applicable)

_____

_____

18. ANTITRUST CERTIFICATION STATEMENT

Antitrust Certification Statement

Per 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)
2. In connection with this Proposal, 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 Proposal, 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 Proposal 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.

(Required: Check only one)

- ☐ Agree
- ☐ Do Not Agree

19. FORM 1295 - CERTIFICATE OF INTERESTED PARTIES

Form 1295 - Certificate of Interested Parties

Pursuant HB 1295, the addition of section 2252.908 of the Government Code, all awarded vendors must fill out electronically, with the Texas Ethics Commission's online filing application. www.ethics.state.tx.us.whatsnew/elf_info_form1295.htm

The law states that a governmental entity or state may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties (Form 1295) to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental or state agency. The Texas Ethics Commission has adopted rules requiring the business to file Form 1295 electronically with the Commission.

This form must then be signed and returned, prior to any business transaction.

Please note the following:
Box 2: Please enter Galena Park ISD
Box 3: Please use CSP# 25-603 as the identification number being requested and Galena Park ISD Multi-Use Facility as description of goods or services.

Please acknowledge that you have read and understand that the district may not do business with your company without the submittal of this form.

(Required: Check only one)

- ☐ Yes
- ☐ No

20. CONTRACT DOCUMENTS DEVIATIONS OR EXCEPTIONS

Contract Documents (Sample Contract Documents)
The Contract Documents (Sample Contract Documents) are provided, please check if you agree or disagree to the Terms of the Agreement as presented. This is your electronic signature.

(Required)

☐ I have Read and Agree

No Deviations or Exceptions
I certify that there are NO deviations or exceptions from the attached specific terms, conditions, and specifications.

(Required: Check only one)

☐ Agree - No Deviations
☐ Do Not Agree - Please see below

Deviations and Exceptions
If your company intends to deviate from the Specifications listed in the attached documents, all such deviations and exceptions must be listed here, with complete and detailed conditions and information included. The District will consider any deviations or exceptions in its Proposal award decisions. The District reserves the right to accept or reject any proposals based upon any deviations indicated below. If none, please enter N/A (Not Applicable).

Proposal Lines

BASE PROPOSAL

Item Notes: The undersigned agrees to perform all work required by the Proposal Documents which is not specifically indicated to be proposed as an Alternate for the sum of:

1.1 BASE PROPOSAL: **$** _____

1.2 Owner's Contingency Allowance: **960,000**

1.3 Base Proposal + Owner's Contingency Total: **$** _____

_____

(Written Total Amount)

Acknowledge Addendum(s)

Acknowledge receipt of Addendum 1 through _____

Alternate Proposal Lines

ALTERNATES PROPOSAL

Alternate No. 1
(Response required)

1 BASE PROPOSAL REDUCTION: **$** _____

Item Notes: If there is a discount to the Base Proposal enter that amount here.

Alternate No. 2 **$** _____
(Response required)

State in the proposal form the amount to be added to the base proposal for providing a 120-yard indoor practice facility in lieu of an 80-yard indoor practice facility.

Alternate No. 3 **$** _____
(Response required)

State in the proposal form the amount to be added to the base proposal for providing the renovation of the coach's offices and training area in existing field house. Lavatory replacement in these areas are to be provided in the base bid and not to be included in this alternate

Alternate No. 4 **$** _____
(Response required)

State in the proposal form the amount to be added into the base proposal for providing the brick veneer and metal wall panel system in the existing field house.

Alternate No. 5 - State in the proposal form the amount to be added to the base proposal to furnish and install the following Air Handling Units as listed in the specifications. Include estimated lead time/delivery to be assessed as part of the selection process.
(Response required)

5a Carrier **$** _____

5b Temtrol **$** _____

5c Trane **$** _____

Alternate No. 6 - State in the proposal form the amount to be added to the base proposal to furnish and install the following Chillers as shown in the Contract Documents. Include estimated lead time/delivery to be assessed as part of the selection process
(Response required)

6aCarrier Standard Efficiency Chillers **$** _____

6b Carrier High Efficiency Chillers **$** _____

6c Trane Standard Efficiency Chiller **$** _____

6d Trane High Efficiency Chillers **$** _____

6e York Standard Efficiency Chillers **$** _____

6f York High Efficiency Chiller **$** _____

Alternate No. 7 - State in the proposal form the amount to be added to the base proposal to furnish and install the following BMCS system
(Response required)

7a Reliable Controls by Unify Energy Solutions **$** _____

7b Trane Controls by Hunton Group **$** _____

7c ALC by Automated Logic Houston **$** _____

7d Distech Controls **$** _____

Alternate No. 8 - State in the proposal form the amount to be added to the base proposal to furnish and install the turf for the indoor practice facility.
(Response required)

8a FieldTurf **$** _____

8b Hellas **$** _____

8c Mammoth **$** _____

Alternate No. 9 - State in the proposal form the amount to be added to the base proposal to furnish and install the turf in the new weight room.
(Response required)

9a FieldTurf **$** _____

9b Hellas **$** _____

9c Mammoth **$** _____

Alternate No. 10 - State in the proposal form the amount to be added to the base proposal to furnish and install the rubber flooring in the new weight room. The amount should include both rubber flooring and turf.
(Response required)

9a Tarkett **$** _____

9b ProMaxima **$** _____

9c Mondo **$** _____

UNIT PRICES

Unit Price 01: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

Unit Price 02: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

Unit Price 03: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

Unit Price 04: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

SUBCONTRACTOR LISTING

(Line excluded from response total)

Item Notes: One of the evaluation criteria used to select the successful General Contractor is the proposed project team, including sub-contractors to be used for the Work. In order to receive consideration for the award of the Contract, each Proposer must submit a list of sub-contractors proposed be used for the Work.

Recognizing the Proposer may not have firm contractual agreements with sub-contractors immediately following submission of Proposals, an allowance is made to submit two (2) sub-contractors for each trade listed below.

Package Attributes

1. Self-Performed

Will your company be self-performing ALL work.

- ☐ Yes, all work is self-performed
- ☐ No, we will use subcontractors

(Required: Check only one)

Mechanical Primary _____

Mechanical Secondary _____

Electrical Primary _____

Electrical Secondary _____

Plumbing Primary _____

Plumbing Secondary _____

Site Work Primary _____

Site Work Secondary _____

Site Utilities Primary _____

Site Utilities Secondary _____

Concrete Primary _____

Concrete Secondary _____

Masonry Primary _____

Masonry Secondary _____

Steel Fabrication Primary _____

Steel Fabrication Secondary _____

Steel Erection Primary _____

Steel Erection Secondary _____

Dampproofing Primary _____

Dampproofing Secondary _____

Fire Sprinkler Primary _____

Fire Sprinkler Secondary _____

Roofing Primary _____

Roofing Secondary _____

Hollow Metal Primary _____

Hollow Metal Secondary _____

SCPL Doors Primary _____

SCPL Doors Secondary _____

Finish Hardware Primary _____

Finish Hardware Secondary _____

Glass & Glazing Primary _____

Glass & Glazing Secondary _____

Gyp Bd Systems Primary _____

Gyp Bd Systems Secondary _____

Ceramic Tile Primary _____

Ceramic Tile Secondary _____

Flooring Primary _____

Flooring Secondary _____

Painting Primary _____

Painting Secondary _____

Toilet Partitions Primary _____

Toilet Partitions Secondary _____

Toilet Acc's. Primary _____

Toilet Acc's. Secondary _____

Casework Primary _____

Casework Secondary _____

Fire Alarm Primary _____

Fire Alarm Secondary _____

BCMS Primary _____

BCMS Secondary _____

Data / Tech Primary _____

Data / Tech Secondary _____

Security Primary _____

Security Secondary _____

Small Business Enterprise Program (SBEP)

Item Notes: The Small Business Enterprise Program (SBEP) provides increased business opportunities for small businesses to participate in contracting and procurement opportunities with the District. The SBEP is a goal-oriented program, requiring contractors to whom the District awards prime contracts for architectural design services, engineering design services, or construction services valued at $50,000 or greater to use good-faith efforts to utilize small business subconsultants, subcontractors, and suppliers.

To be eligible as a small business under the SBEP, a business shall:

1. Demonstrate that the firm's gross revenues or number of employees averaged over the past three years, inclusive of any affiliates as defined by 13 C.F.R. 121.103, does not exceed the size standards as defined pursuant to Section 3 of the Small Business Act and 13 C.F.R. 121.201.

2. Have or be eligible for one of the following small business certifications:
   a. Port of Houston Authority SBE Certification (not including any location requirement);
   b. Metropolitan Transit Authority of Harris County (METRO) SBE Certification (not including any location requirement);

In eligible procurements, the District may award additional scoring points to a Proposer or proposer based on its SBEP participation. The District may likewise consider a Proposer or proposer's failure to achieve SBEP participation commitments on previous District projects when scoring a subsequent Proposal. Any weighted point values available to a Proposer or proposer related to SBEP participation shall be published with all other weighted selection criteria in the procurement solicitation.

The respondent to this CSP shall list their Small Business prime contact or sub-contract participation goal /commitment percentage (0%-100%) of their total contract.

1. Provide the Small Business prime contract or sub-contract participation goal /commitment percentage (0%-100%).

(Response required)

Participation goal /commitment percentage (0%-100%) _____

Galena Park ISD Small Business Enterprise Proposal Sheet		
Proposed Subcontractor	**SBE Certification No**	**Amount of Work Proposed**
Total Goal/Commitment		**$**

Small Business Enterprise (SBE) Participation Scoring Criteria:

Contractors will be awarded points based on their level of Small Business Enterprise (SBE) participation as follows:

- Greater than 10% Participation: Full 5 points will be awarded
- Between 5% and 10% Participation: 3 out of 5 points will be awarded.
- Less than 5% Participation: 1 out of 5 points will be awarded

Contractor Information

Company Name: _____

Contact Name: _____

Address: _____

_____

Phone: _____

Fax: _____

Email: _____

Contractor Notes:

_____

_____

The undersigned, in submitting this Proposal and endorsement of same, represents that he/she is authorized to obligate his/her Firm, that he/she is an equal opportunity employer and will not discriminate with regard to race, color, religion, sex, national origin, age or disability unrelated to job performance of this Proposal; that he/she will abide by all the policies and procedures of Galena Park ISD; and that he/she has read this entire Proposal package, is aware of the covenants contained herein and will abide by and adhere to the expressed requirements in ALL sections of this Proposal.

Print Name _____ Signature_____

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

► **Go to *www.irs.gov/FormW9* for instructions and the latest information.**

Give Form to the requester. Do not send to the IRS.

Print or type. See **Specific Instructions** on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ► _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ►

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN,* later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

			–			–				

or

Employer identification number

		–							

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here	**Signature of U.S. person** ►	**Date** ►

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9.*

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and

4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting,* later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the instructions for Part II for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code,* later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships,* earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code,* later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester,* later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at *www.SSA.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/Businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. Go to *www.irs.gov/Forms* to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to *www.irs.gov/OrderForms* to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code,* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account[1]
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor[2]
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee[1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner[1]
6. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	**Give name and EIN of:**
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity[4]
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships,* earlier.

***Note:** The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov.* You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at *spam@uce.gov* or report them at *www.ftc.gov/complaint.* You can contact the FTC at *www.ftc.gov/idtheft* or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see *www.IdentityTheft.gov* and Pub. 5027.

Visit *www.irs.gov/IdentityTheft* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

SAMPLE

FORM CIQ

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

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

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

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

OFFICE USE ONLY

Date Received

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

Company/Independent Contractor's Name

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

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

Enter "N/A" if there is no employment of business relationship

Name of Officer

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

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

☐ Yes ☐ No **At least one box must be checked**

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

☐ Yes ☐ No **At least one box must be checked**

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

If a relationship exists, please describe it here

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

7 **Signature**

Signature of vendor doing business with the governmental entity

Date

Date

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

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

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

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

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

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

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

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

***

(2) the vendor:

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

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

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

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

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

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

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

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

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

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

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

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

(1) the date that the vendor:

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

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

(2) the date the vendor becomes aware:

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

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

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

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

_____

Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

_____ _____

Signature of vendor doing business with the governmental entity Date

CERTIFICATE OF INTERESTED PARTIES FORM 1295

Certificate of Interested Parties (Form 1295) – Must be filled out electronically with the Texas Ethics Commission's online filing application, printed out, signed, and submitted to GPISD with the proposal.

GPISD is required to comply with House Bill 1295, which amended the Texas Government Code by adding Section 2252.908, Disclosure of Interested Parties. Section 2252.908 prohibits GPISD from entering into a contract resulting from this solicitation with a business entity unless the business entity submits a Disclosure of Interested Parties (Form 1295) to GPISD 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:

"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).

"Interested Party" means a person who has a controlling interest in a business entity with whom GPISD contracts or 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).

"Controlling interest" means an Districtship interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent; 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 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).

"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 receives compensation from the business entity for the person's participation; communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract; and is not an employee of the business entity. TEX. ETHICS COMM. RULE 46.3(e).

As a "business entity," unless an exception applies, 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**
    a. All Vendors must complete Form 1295, even if no interested parties exist, unless Vendor is a publicly traded business entity or wholly owned subsidiary of the same, an electric utility or a gas utility.
    b. In Section 2, insert "Galena Park Independent School District"
    c. In Section 3, insert the GPISD RFP/RFQ # 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; and
4. Submit the completed, signed Form 1295 by attaching the form to your proposal.

GPISD must notify the Texas Ethics Commission of the receipt of the filed Form 1295 no later than the 30th day after receipt by GPISD. After GPISD acknowledges the Form 1295, the Texas Ethics Commission is required to post the completed Form 1295 to its website within seven business days after receiving notice from GPISD.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

OFFICE USE ONLY

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

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

Business Company Name

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

Galena Park ISD

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

Bid RFP # and Name of RFP (Co-op Contract optional)

4

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

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____ , on the _____ day of _____, 20_____.
(month) (year)

_____
Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

Must file online at www.ethics.state.tx.us/File

STATE AND FEDERAL CERTIFICATION FORM

Accordingly, the parties agree that the following terms and conditions apply to the Contract between the District and vendor ("Vendor") to the extent applicable to the contract type or dollar amount:

CERTIFICATION REGARDING TERRORIST ORGANIZATIONS & BOYCOTTING OF ISRAEL

Vendor 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. Vendor further certifies and verifies that neither Vendor, nor any affiliate, subsidiary, or parent company of Vendor, if any (the "Vendor Companies"), boycotts Israel, and Vendor agrees that Vendor and Vendor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include terminating business activities or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory.

VERIFICATION REGARDING CONTRACTS WITH COMPANIES THAT BOYCOTT ENERGY COMPANIES

If Vendor is required to make a verification pursuant to Section 2274.002 of the Texas Government Code, Vendor hereby verifies that it does not, and will not for the duration of the contract, boycott energy companies. "Boycott energy company" means, without an ordinary business purpose, 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 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). *[Verification does not apply to a vendor that employs less than 10 full-time employees;* ***AND*** *the value of the contract is less than $100,000 – Note that the term "company" does not include a sole proprietorship.]*

VERIFICATION REGARDING CONTRACTS WITH COMPANIES THAT DISCRIMINATE AGAINST FIREARMS ENTITY OR TRADE ASSOCIATION

If Vendor is required to make a verification pursuant to Section 2274.002 of the Texas Government Code, Vendor hereby verifies that it (1) does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and (2) will not discriminate during the term of the contract against a firearm entity or firearm trade association. *[Verification does not apply to a vendor that employs less than 10 full-time employees;* ***AND*** *the value of the contract is less than $100,000 – Note that the term "company" does not include a sole proprietorship.]*

REQUIRED CONTRACT PROVISIONS FOR NON-FEDERAL ENTITY CONTRACTS UNDER FEDERAL AWARDS APPENDIX II TO 2 CFR PART 200

(A) [*Applicable ONLY to contracts in excess of $250,000.*] **Contracts for more than the simplified acquisition threshold currently set at $250,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.**

Pursuant to Federal Rule (A) above, when the District expends federal funds, the District reserves all rights and privileges under the applicable laws and regulations with respect to this procurement in the event of breach of contract by either party.

(B) [*Applicable ONLY to contracts in excess of $10,000.*] **Termination for cause and for convenience by the grantee or subgrantee including the manner by which it will be affected and the basis for settlement.**

Pursuant to Federal Rule (B) above, when the District expends federal funds, the District reserves the right to immediately terminate any agreement in excess of $10,000 resulting from this procurement process in the event of a breach or default of the agreement by Vendor in the event Vendor fails to: (1) meet schedules, deadlines, and/or delivery dates within the time specified in the procurement solicitation, contract, and/or a purchase order; (2) make any payments owed; or (3) otherwise perform in accordance with the contract and/or the procurement solicitation. The District also reserves the right to terminate the contract immediately, with written notice to vendor, for convenience, if the District believes, in its sole discretion that it is in the best interest of the District to do so. Vendor will be compensated for work performed and accepted and goods accepted by the District as of the termination date if the contract is terminated for convenience of the District. Any award under this procurement process is not exclusive and the District reserves the right to purchase goods and services from other vendors when it is in the District's best interest.

(**C)** [*Applicable ONLY to federally assisted construction contracts.*] **Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."**

Pursuant to Federal Rule (C) above, when the District expends federal funds on any federally assisted construction contract, the equal opportunity clause is incorporated by reference herein.

(D) [*Applicable ONLY to prime construction contracts in excess of $2,000 where federal funds are being used for the project*] **Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of $2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.**

(E) [*Applicable ONLY to contracts in excess of $100,000 involving mechanics or laborers.*] **Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.**

Pursuant to Federal Rule (E) above, when the District expends federal funds, Vendor certifies that Vendor will be in compliance with all applicable provisions of the Contract Work Hours and Safety Standards Act during the term of an award for all contracts by the District resulting from this procurement process.

(F) Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of "funding agreement" under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

Pursuant to Federal Rule (F) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor agrees to comply with all applicable requirements as referenced in Federal Rule (F) above.

(G) [*Applicable ONLY to contracts in excess of $250,000.*] **Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of $250,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251- 1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).**

Pursuant to Federal Rule (G) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor agrees to comply with all applicable requirements as referenced in Federal Rule (G) above.

(H) 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 Federal Rule (H) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor 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.

(I) [*Applicable ONLY to contracts in excess of $100,000*] **Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.**

Pursuant to Federal Rule (I) above, when federal funds are expended by the District, Vendor certifies that during the term and after the awarded term of an award for all contracts by the District resulting from this procurement process, the vendor certifies that it is in compliance with all applicable provisions of the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352). The undersigned further certifies that:

(1) No Federal appropriated funds have been paid or will be paid for on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with the awarding of

a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement.

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

(3) The undersigned shall require that the language of this certification be included in the award documents for all covered sub-awards exceeding $100,000 in Federal funds at all appropriate tiers and that all subrecipients shall certify and disclose accordingly.

(J) Procurement of Recovered Materials – When federal funds are expended, the District and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include: (1) procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; (2) procuring solid waste management services in a manner that maximizes energy and resource recovery; and (3) establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

Pursuant to Federal Rule (J) above, when federal funds are expended by the District, as required by the Resource Conservation and Recovery Act of 1976 (42 U.S.C. § 6962(c)(3)(A)(i)), the vendor certifies, by signing this document, that the percentage of recovered materials content for EPA-designated items to be delivered or used in the performance of the contract will be at least the amount required by the applicable contract specifications or other contractual requirements.

(K) Domestic Preferences for Procurements – As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of 2 CFR Part 200.322, "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stag through the application of coatings, occurred in the United States. Moreover, for purposes of 2 CFR Part 200.322, "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum, plastics and polymer-based products such as polyvinyl chloride pipe, aggregates such as concrete, class, including optical fiber, and lumber.

Pursuant to Federal Rule (K) above, when federal funds are expended by the District, vendor certifies, by signing this document, that to the greatest extent practicable vendor will provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

(L) Ban on Foreign Telecommunications – Federal grant funds may not be used to purchase equipment, services, or systems that use "covered telecommunications" equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. "Covered telecommunications" means purchases from Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities), and video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

Pursuant to Federal Rule (L) above, when federal funds are expended by the District, vendor certifies, by signing this document, vendor will not purchase equipment, services, or systems that use "covered telecommunications", as defined by 2 CFR §200.216, equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

RECORD RETENTION REQUIREMENTS FOR CONTRACTS INVOLVING FEDERAL FUNDS

When federal funds are expended by the District for any contract resulting from this procurement process, Vendor certifies that it will comply with the record retention requirements detailed in 2 CFR § 200.334. Vendor further certifies that it will retain all records as required by 2 CFR § 200.334 for a period of three years after grantees or subgrantees submit final expenditure reports or quarterly or annual financial reports, as applicable, and all other pending matters are closed.

CERTIFICATION OF COMPLIANCE WITH THE ENERGY POLICY AND CONSERVATION ACT

When the District expends federal funds for any contract resulting from this procurement process, Vendor certifies that it will comply with the mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6321 et seq.; 49 C.F.R. Part 18).

CERTIFICATION OF EQUAL EMPLOYMENT STATEMENT

It is the policy of the District not to discriminate on the basis of race, color, national origin, gender, limited English proficiency or handicapping conditions in its programs. Vendor agrees not to discriminate against any employee or applicant for employment to be employed in the performance of this Contract, with respect to hire, tenure, terms, conditions and privileges of employment, or a matter directly or indirectly related to employment, because of age (except where based on a bona fide occupational qualification), sex (except where based on a bona fide occupational qualification) or race, color, religion, national origin, or ancestry. Vendor further agrees that every subcontract entered into for the performance of this Contract shall contain a provision requiring non-discrimination in employment herein specified, binding upon each subcontractor. Breach of this covenant may be regarded as a material breach of the Contract.

CERTIFICATION OF COMPLIANCE WITH BUY AMERICA PROVISIONS

[*Only Applicable to Contracts funded under the National School Lunch Program*] The Buy American regulations promulgated by USDA and TDA require public school districts to purchase domestically grown and processed food to the maximum extent practicable. The food product must consist of agricultural commodities that were grown domestically, unless an authorized exception exists and has been approved by the District.

CERTIFICATION OF ACCESS TO RECORDS – 2 C.F.R. § 200.336

Vendor agrees that the District's Inspector General or any of their duly authorized representatives shall have access to any books, documents, papers and records of Vendor that are directly pertinent to Vendor's discharge of its obligations under the Contract for the purpose of making audits, examinations, excerpts, and transcriptions. The right also includes timely and reasonable access to Vendor's personnel for the purpose of interview and discussion relating to such documents.

CERTIFICATION OF APPLICABILITY TO SUBCONTRACTRS

Vendor agrees that all contracts it awards pursuant to the Contract shall be bound by the foregoing terms and conditions.

VENDOR AGREES TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, RULES, REGULATIONS, AND ORDINANCES. IT IS FURTHER ACKNOWLEDGED THAT VENDOR CERTIFIES COMPLIANCE WITH ALL PROVISIONS, LAWS, ACTS, REGULATIONS, ETC. AS SPECIFICALLY NOTED ABOVE.

Vendor's Name: _____

Address, City, State, and Zip Code: _____

Phone Number: _____ Fax Number: _____

Printed Name and Title of Authorized Representative: _____

Email Address: _____

Signature of Authorized Representative: _____

Date: _____

CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION

THIS FORM MUST BE COMPLETED BY ALL SERVICE PROVIDERS

Section 1

Vendor (Name): _____

Contract Dates: _____ Drivers License Number: _____ Date of Birth: _____

No _____ Will employees, including you have continuing duties related to the proposal or contract named above or any other services performed at GPISD?

Until further guidance is received, GPISD considers "continuing duties" to mean repetitive work duties rather than a onetime appearance or engagement.

No _____ Will those employees, including yourself, have direct contact with students?

Direct contact with students is contact that results from activities that provide substantial opportunity for verbal or physical interaction with students and that is not supervised by a certified educator or other professional district employee. Examples include unsupervised coaching, tutoring, or other services to students. 19 Tex. Admin. Code § 153.1101(7).

If either question is answered "no" vendor should complete section 2 of this form.

If answer to both questions is "yes" vendor should complete section 3 of this form.

Section 2

I agree and understand employees of the company or individuals, including myself, who have not received the required criminal background check because the above description does not apply to them/myself will be considered visitors when on school campuses and must follow school district and campus policies related to visitors on school campuses.

_____ _____ _____

Signature of Vendor Print Name Date

Section 3

As a result of revised DPS procedures related to access to national criminal history record information, only NCPA qualified school district contractors have access to national criminal history record information. Accordingly, non-NCPA qualified contractors must cooperate with the school district in facilitating criminal history reviews when the school performs the DPS FACT Clearinghouse review of criminal history record information in place of the school contractor. Accordingly, contractors must certify one of the following, depending on whether contractor is NCPA-qualified.

☐ **NCPA Qualified**: The undersigned certifies that all employees, including myself, of the company that I own, operate, or manage, or myself as an independent contractor who have continuing duties related to the service to be performed on a GPISD campus and who also have direct contact with students have undergone the required criminal history background check or national criminal history record information review which may include fingerprints and photographs and that no prohibited contact as described herein was revealed.

OR

☐ **Non-NCPA Qualified**: The undersigned certifies that I have ensured that all employees, including myself, of the company that I own, operate, or manage, or myself as an independent contractor who have continuing duties related to the service to be performed on a GPISD campus and who also have direct contact with students have cooperated with GPISD in submitting all information necessary for GPISD to utilize its LEE Fast Pass procedure to perform the required criminal history background check or national criminal history record information review which may include fingerprints and photographs.

_____ _____ _____

Signature of Vendor Print Name Date

INSTRUCTIONS FOR COMPLETING PRE-EMPLOYMENT OR PRE-SERVICE AFFIDAVIT FOR EDUCATIONAL ENTITIES

Pursuant to Texas Education Code §22A.055, as enacted by SB 571 (89th Legislature, 2025), all individuals who are applying for employment with or who will act as a service provider for an educational entity must complete the attached Pre-Employment or Pre-Service Affidavit for Educational Entities prior to providing services. Completed affidavits should be returned to [Purchasing Department] at [purchasing@galenaparkisd.com].

Please note the following requirements:

1. **Who Must Complete the Affidavit**

   Every employee of contractor, and every employee of any subcontractor, who will be present at an instructional campus to provide services must complete this affidavit before services begin.

2. **Definition of "Service Provider"**

   Under Texas Education Code §22A.001(8), "service provider" means a person who provides services to an educational entity. The term includes:
   - a contractor or subcontractor for an educational entity;
   - a provider of tutoring services;
   - an entity that contracts to operate a district campus under Texas Education Code §11.174;
   - a staffing provider for an educational entity; and
   - a person employed by or under the control of any of the above.

3. **Use of the Affidavit**

   This affidavit must be signed, dated, and returned for each qualifying employee before they are permitted to provide services on campus.

   The affidavit must be accurate and complete. Failure to disclose required information will result in termination of service and constitutes a **Class B misdemeanor** under Texas law.

4. **Ongoing Compliance**

   You have a continuing duty to promptly report to the District any updates or changes to the information disclosed in the attached affidavit.

PRE-EMPLOYMENT OR PRE-SERVICE AFFIDAVIT FOR EDUCATIONAL ENTITIES

Pursuant to Texas Education Code (TEC) §22A.055, a person applying for employment with or who will act as a service provider for an educational entity (school district, district of innovation, open-enrollment charter school, other charter entity, regional education service center, or shared services arrangement) ***must*** *submit, using a form adopted by the agency, a pre-employment or pre-service affidavit.*

Section 1 - Penalties for Failure to Disclose Required Information

A person commits an offense, a Class B misdemeanor, if the person fails to disclose information required to be disclosed under TEC §22A.055. Additionally, a determination that an employee or person providing services failed to disclose information required to be disclosed by a person under TEC §22A.055 is grounds for termination of employment or service.

Section 2 – Disclosure of Work History and Consent for Release of Records

Have you previously been employed by or acted as a service provider, or are you currently employed by or currently acting as a service provider for a public or private school?	Yes ☐ No ☐
Do you consent for release of your prior employment records? *Pursuant to TEC §22A.055, a person applying for employment with or who will act as a service provider for an educational entity must consent for release of the person's employment records.*	Yes ☐ No ☐

Section 3 – Disclosure of Investigation or Placement on the Do Not Hire Registry

Have you ever been terminated, non-renewed, or discharged from a public or private school?	Yes ☐ No ☐
Have you ever resigned, in lieu of being terminated or discharged, from a public or private school?	Yes ☐ No ☐

Have you ever been investigated by a law enforcement or child protective services agency for, or charged with, adjudicated for, or convicted of, an offense involving the following conduct described by TEC §22A.051(a)(2)(A), (B), (C), or (D) ?: • abused or otherwise committed an unlawful act with a student or minor, including by engaging in conduct that involves physical mistreatment or constitutes a threat of violence to a student or minor and that is not justified under Chapter 9, Penal Code, regardless of whether the conduct resulted in bodily injury; • was involved in or solicited a romantic relationship with or solicited or engaged in sexual contact with a student or minor; • engaged in inappropriate communications with a student or minor, as defined by board rule; • failed to maintain appropriate boundaries with a student or minor, as defined by board rule; *Adjudication and conviction refer to a conviction, plea of guilty or no contest (nolo contendre), probation, suspension, or deferred adjudication.* *Charge refers to a formal criminal charge as documented by a primary charging instrument (a complaint, information, or indictment) under the Texas Code of Criminal Procedure.*	Yes ☐ No ☐
Have you ever been investigated by a licensing authority or had a license, certificate, or permit denied, suspended, revoked, or subject to another sanction in this state or another state for conduct described by TEC §22A.051(a)(2)(A), (B), (C), or (D), which is described above?	Yes ☐ No ☐
Are you now the subject of an inquiry, disciplinary action, review, or investigation, by any public or private school, by a teacher-licensing agency, by any law enforcement agency, or in the court of Texas or any other state in connection with any alleged misconduct?	Yes ☐ No ☐
Have you ever been listed on the Do Not Hire Registry under TEC §22A.151 by the Texas Education Agency.	Yes ☐ No ☐
If you answered YES to any question in this section, disclose all relevant facts known to you pertaining to the matter, including, if applicable to the action, whether the allegation was determined to be true or false.	

Section 3 – Declaration of Applicant

Name (First, Middle, Last)	Date of Birth
Address (House/Unit # and Street Name)	
Address (City, State, Zip Code)	County
Signature	Date Signed

ADDENDUM TO AGREEMENT

This Addendum is entered into by and between Galena Park Independent School District ("District") and the Vendor/Contractor named below and is incorporated into the Agreement between the parties. The purpose of this Addendum is to ensure compliance with recent legislative updates enacted by the Texas Legislature.

1. Certification Regarding Prohibition on Diversity, Equity, and Inclusion Duties

Pursuant to Section 11.005(b)(2), Texas Education Code, the Vendor/Contractor hereby certifies that it shall not engage in, and shall prohibit any of its employees, agents, or subcontractors from engaging in, diversity, equity, and inclusion ("DEI") duties (as defined by Section 11.005(a)(1)-(4) of the Texas Education Code) at, for, or on behalf of the District, except as required by state or federal law.

2. Conflict of Interest Certification

Pursuant to Section 11.067, Texas Education Code, the Vendor/Contractor certifies that no member of the District's board of trustees, nor any individual related to a board member within the second degree by consanguinity or affinity, has a substantial interest (as defined by 11.067(c)(1)(-2) of the Texas Education Code) in the Vendor/Contractor or any subcontractor hired by the Vendor/Contractor, and that no board member has received or been promised gifts or in-kind services valued at more than $250 from the Vendor/Contractor. Vendor/Contractor further certifies that it will not engage in any activity prohibited by Section 11.067 during the term of this Agreement.

3. Acknowledgement of Pre-Employment/Pre-Service Affidavit for Service Providers

Pursuant to Texas Education Code §22A.001(8), a "Service Provider" is defined as a person who provides services to an educational entity, including a contractor or subcontractor of an educational entity; a provider of tutoring services; an entity that contracts to operate a district campus under §11.174; a staffing provider for an educational entity; and person employed by or under the control of any of the aforementioned contractors, subcontractors, providers, and entities ("Service Provider"). By entering into this Agreement, Vendor/Contractor acknowledges that all Service Providers must complete and return the Pre-Employment/Pre-Service Affidavit in the form adopted by the Texas Education Agency ("Affidavit") prior to delivering services. Vendor/Contractor further acknowledges and agrees that it has a continuing duty throughout the term of this Agreement to ensure that the information provided in each affidavit remains accurate. Vendor/Contractor shall ensure that all employees and subcontractors promptly update and provide to the District any revised Affidavit or supplemental disclosure if circumstances change such that the information previously

provided is no longer complete or accurate. Vendor/Contractor shall ensure that any new employees or subcontractors engaged after commencement of services complete and return the Affidavit before providing services. Service Providers who fail to comply with these requirements are subject to termination and are prohibited from providing services to the District.

By signing below, Vendor/Contractor acknowledges and agrees that this Addendum is incorporated into and made part of the Agreement between the District and the Vendor/Contractor.

Vendor/Contractor Signature:_____
Name/Title:_____
Date: _____

GALENA PARK INDEPENDENT SCHOOL DISTRICT

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR BUILDING CONSTRUCTION CONTRACTS

GPISD Multi-Use Facility

1001

CSP # 25-603

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR BUILDING CONSTRUCTION CONTRACTS

Agreement made as of November 10, 2025, between the Board of Trustees of the Galena Park Independent School District, hereinafter called the Owner,

and the Contractor:	**[INSERT CONTRACTOR NAME]** **[INSERT CONTRACTOR ADDRESS]**
Project:	**GPISD Multi-Use Facility**
Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**
The Architect/Engineer is:	**VLK Architects** **20445 State Highway 249; Suite 350; Houston, Texas 77070**

The Contractor and the Owner for the consideration hereinafter named agree as follows:

ARTICLE 1. SCOPE OF WORK: The Contractor shall execute the entire Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others. The Contract Documents are listed below; these form the Contract and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract Documents, in order of priority, are:

This Agreement (Standard Form of Agreement Between Owner and Contractor, as may be amended by duly executed and authorized Change Orders)
Uniform General Conditions of the Contract for Construction – Consisting of 26 Pages, as modified by the:
Supplementary Conditions of the Contract for Construction – Consisting of 3 Page(s)
Special Conditions of the Contract for Construction – Consisting of 2 Page(s)
Project Manual per Attachment "A" – Consisting of ___Page(s)
Drawing List per Attachment "B" – Consisting of ___Page(s)
Addendum #1 – Dated _____ – Consisting of ___ Page(s)
Addendum #2 – Dated _____ – Consisting of ___ Page(s)
Addendum #3 – Dated _____ – Consisting of ___ Page(s)

Alternates: The following Alternates, fully described in the Contract Documents, are included as a part of this Contract:

(ACCEPTED ALTERNATES WILL BE LISTED HERE)

Unit Prices: The following Unit Prices, fully described in the Contract Documents, are included as a part of this Contract:

(UNIT PRICES WILL BE LISTED HERE)

ARTICLE 2. TIME OF COMPLETION: The Work to be performed under this Contract shall be commenced within ten (10) days from the date of the Notice to Proceed issued by the Owner; and the Contractor shall achieve Substantial Completion within the time stipulated in the Supplementary Conditions of the Contract, subject to

adjustments of this Contract Time as provided elsewhere in the Contract Documents. The time set forth for completion of the Work is an essential element of the Contract.
ARTICLE 3. THE CONTRACT SUM: The Owner shall pay the Contractor for performance of the Contract, subject to additions and deductions provided therein, the sum of

Base Bid	**$**
Alternate 1	
Alternate 2	
Owner's Contingency Allowance	**960,000**
	$

and make payments on account as provided elsewhere in the Contract Documents.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the day and year first written above.

ATTEST: (Notary Seal)

By:

_____
(notary signature)

_____
(notary name printed) (notary expiration date)

CONTRACTOR
[INSERT CONTRACTOR NAME] Inc.

By: _____
(original signature)

_____
(name and title printed)

BOARD OF TRUSTEES GALENA PARK INDEPENDENT SCHOOL DISTRICT

By:

_____
Signature

_____
Print Name

_____
Title

CERTIFICATE OF APPROVAL

I hereby certify that pursuant to procedures authorized by the Board of Trustees of the Galena Park Independent School District, the foregoing Agreement was approved the 10 day of November in the year 2025, and that the person whose signature appears above is authorized to execute such Agreement on behalf of the Board.

INSTRUCTIONS FOR PERFORMANCE AND PAYMENT BONDS

1. The name, including full legal name, and business or residence address of each individual party to the bond shall be inserted in the space provided therefore, and each such party shall sign the bond with his/her usual signature on the line opposite his/her seal.

2. If the Principals are partners, their individual names shall appear in the space provided therefore, with the recital that they are partners composing a firm, naming it, and all the members of the firm shall execute the bond as individuals and as co-partners.

3. If the Principal or Surety is a corporation, the name of the state in which incorporated shall be inserted in the space provided therefore, and said instrument shall be executed and attested under the corporate seal as indicated in the form. If the Corporation has no corporate seal, the fact shall be stated, in which case a scroll of adhesive seal shall appear following the corporate name.

4. The official character and authority of the person or persons executing the bond of the Principal, if a corporation, shall be certified by the Secretary or Assistant Secretary, according to the form herein provided. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the Secretary or Assistant Secretary, under the corporate seal, to be true copies.

THE DATE OF THE BOND MUST NOT BE PRIOR TO THE DATE OF THE STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR.

PERFORMANCE BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we,

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

as Principal, hereinafter called Contractor, and
(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the Galena Park Independent School District as Obligee, hereinafter called the Owner, in the amount of

_____ Dollars

($ _____),
for payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the principal has by written agreement dated the 10 day of November in the year 2025, entered into a contract with the Owner for

Project:	**GPISD Multi-Use Facility**
Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**

in accordance with the Contract Documents prepared by

The Architect/Engineer is:	**VLK Architects** **20445 State Highway 249; Suite 350; Houston, Texas 77070**

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW THEREFORE, the condition of this obligation is such that, if the Contractor shall faithfully perform the Contract in accordance with the Contract Documents, and shall fully indemnify and save harmless the Owner from all cost and damage which the Owner may suffer by reason of the Contractor's default or failure so to do and shall fully reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

In the event the Contractor is declared in default under the Contract, Surety will within Fifteen (15) days of the Owner's declaration of such default take over and assume completion of said Contract and become entitled to the payment of the balance of the Contract Sum. Conditioned upon the Surety's faithful performance of its obligations, the liability of the Surety for the Contractor's default shall not exceed the penalty of this bond.

The Surety agrees to pay to the Owner upon demand all loss and expense, including attorney's fee, incurred by the Owner by reason of or on account of any breech of this agreement by Surety.

Provided further, that if any legal action be filed upon this bond, venue shall lie in Harris County, State of Texas.

IN WITNESS WHEREOF, the above bonded parties have executed this instrument under their several seals this

_____ day of _____in the year 20 _____, the name and corporate seals of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

ATTEST: (Notary Seal)

By: _____
(notary signature)

_____
(notary name printed) (notary expiration date)

PRINCIPAL

By: _____
(original signature)

_____
(name and title printed)

SURETY'S

By: _____
(original signature)

_____
(name and title printed)

SURETY HOME OFFICE SERVICING AGENT

_____
(name)

_____
(title)

_____
(address)

_____

_____
(Telephone)

CERTIFICATION 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 that person's signature thereon to be genuine; and that said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

(CORPORATE SEAL)

PAYMENT BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

as Principal, hereinafter called Contractor, and(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the Galena Park Independent School District as Obligee, hereinafter called the Owner, in the amount of

_____ Dollars

($ _____),
for payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the principal has by written agreement dated the 13 day of May in the year 2024, entered into a contract with the Owner for

Project:	**GPISD Multi-Use Facility**
Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**

in accordance with the Contract Documents prepared by

The Architect/Engineer is:	**VLK Architects** **20445 State Highway 249; Suite 350; Houston, Texas 77070**

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.
NOW THEREFORE, the condition of this obligation is such that, if the Contractor shall promptly make payments to all claimants as defined in Chapter 2253 of the Texas Government Code as amended, of all persons supplying labor and materials in the prosecution of the work provided for in said Contract, then this obligation shall be null and void, but otherwise it shall remain in full force and effect. In the event Contractor fails to promptly pay when due persons who have supplied labor, materials, or supplies used in the performance of the said Contract, Surety will, upon receipt of notice from the Owner or a claim in the form required by law, satisfy all undisputed balances due, and make arrangements satisfactory to the interested parties to resolve all amounts disputed in good faith, but

in no event shall the liability of the Surety for the Contractor's failure to promptly pay for labor, materials, or supplies exceed the penalty of this bond.

The Surety agrees to pay to the Owner upon demand all loss and expense, including attorney's fee, incurred by the Owner by reason of or on account of any breech of this agreement by Surety.

Provided further, this bond is made and entered into for the protection of all claimants supplying labor and material in the prosecution of the work provided for in said Contract, and all such claimants shall have a direct right of action under the bond as provided in Chapter 2253 of the Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said chapter to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this

_____ day of _____in the year 20 _____, the name and corporate seals of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

ATTEST: (Notary Seal)

By: _____
(notary signature)

_____
(notary name printed) (notary expiration date)

PRINCIPAL

By: _____
(original signature)

_____
(name and title printed)

SURETY'S

By: _____
(original signature)

_____
(name and title printed)

SURETY HOME OFFICE SERVICING AGENT

_____
(name)

_____
(title)

_____
(address)

_____

_____
(Telephone)

CERTIFICATION AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____ secretary of the Corporation named as Principal within the Performance & Payment bond; that _____, who signed the said bond on behalf of the Principal, was then _____ of said corporation; that I know that person's signature thereon to be genuine; and that said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

(CORPORATE SEAL)

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

TABLE OF CONTENTS

ARTICLE 1 CONTRACT DEFINITIONS
1.1 Contract Documents
1.2 Owner
1.3 Architect/Engineer
1.4 Contractor
1.5 Subcontractor
1.6 Project
1.7 Work
1.8 Day
1.9 Contract Sum
1.10 Substantial Completion
1.11 Pre-Final Inspection
1.12 Final Inspection
1.13 Contract Time
1.14 The Drawings
1.15 The Specifications
1.16 The Project Manual
1.17 Sub-subcontractor

ARTICLE 2 LAWS GOVERNING CONSTRUCTION
2.1 Compliance with Laws
2.2 Wage Rates
2.3 State Sales and Use Taxes
2.4 Antitrust Claims

ARTICLE 3 CONTRACT DOCUMENTS AND BONDS
3.1 Copies Furnished
3.2 Ownership of Contract Documents
3.3 Contract Documents at the Site
3.4 Record Documents
3.5 Performance and Payment Bonds
3.6 Interrelation of Contract Documents
3.7 Tax ID Form

ARTICLE 4 CONTRACT ADMINISTRATION
4.1 General Administration
4.2 Subcontracts
4.3 Access to and Inspection of the Work
4.4 Separate Contracts
4.5 Contract Termination
4.6 Written Notice
4.7 Disputed Matters

ARTICLE 5 CONTRACT RESPONSIBILITIES
5.1 Owner's Responsibilities
5.2 Owner-Contractor Obligations
5.3 Contractor's Responsibilities

5.4 Contractor's Superintendent
5.5 Acts and Omissions
5.6 Conditions at Site or Building
5.7 Insurance
5.8 Safety Precautions and Emergencies
5.9 Materials and Workmanship
5.10 Tests
5.11 Removal of Defective Work
5.12 Royalties and Patents
5.13 Equivalent Materials
5.14 Technical Submittals
5.15 Cleaning

ARTICLE 6 CONTRACT CHANGES
6.1 Change Orders
6.2 Unit Prices
6.3 Claims for Additional Costs
6.4 Claims for Additional Time
6.5 Minor Changes
6.6 Bar to Claims
6.7 Administrative Procedures for Change Orders

ARTICLE 7 CONTRACT PAYMENTS
7.1 Schedule of Values
7.2 Progress Payments
7.3 Claims for Unpaid Labor and Materials

ARTICLE 8 CONTRACT COMPLETION TIME
8.1 Notice to Proceed
8.2 Construction Schedule
8.3 Delays and Extension of Time
8.4 Completion of Work
8.5 Failure to Complete Work on Time

ARTICLE 9 CONTRACT SUBSTANTIAL COMPLETION
9.1 Certification
9.2 Date of Substantial Completion
9.3 Additional Inspection Costs

ARTICLE 10 CONTRACT FINAL ACCEPTANCE AND PAYMENT
10.1 Notification
10.2 Final Payment Documentation
10.3 Final Payment

ARTICLE 11 CONTRACT CORRECTION PERIOD
11.1 One Year Contract Correction Period
11.2 Remedy of Defects Under Warranty

ARTICLE 12 OPERATION AND STORAGE AREAS
12.1 Contractor's Use of Premises
12.2 Contractor's Maintenance of Premises

ARTICLE 1

CONTRACT DEFINITIONS

Whenever the following terms are used in these General Conditions or in the other Contract Documents the intent and meaning shall be interpreted as follows:

1.1 Contract Documents: The Contract Documents consist of the Advertisement for Sealed Proposals, Instructions to Proposers, Proposal Security, Proposal Form, Felony Conviction Notice, Affidavit of Non-collusion, Certificate of Residency, fully executed Owner-Contractor Agreement, Performance Bond, Payment Bond, the Conditions of the Contract (General, Supplementary, Special and other Conditions), the Project Manual, the Drawings, Pre-Proposal Meeting Minutes, all Addenda issued prior to execution of the Contract, other documents listed in the Owner-Contractor Agreement, and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by the Owner and the Contractor, (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.

1.1.1 The Contract Documents form the Contract, which represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and the Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Architect or (4) between any person or entities other than the Owner and the Contractor.

1.1.2 The Contract Documents are complementary, and what is required by any one document shall be as binding as if required by all.

1.2 Owner: The Board of Trustees of the Galena Park Independent School District, who shall execute this Contract in the name of the School District, and who, along with certain designated administrative employees, shall be responsible for the administration of the Contract.

1.3 Architect/Engineer: An Architect registered in accordance with Occupation Code, Title 6, Chapter 1051 and/ or a professional Engineer, in accordance with Occupations Code 1001.057. Contract Documents by the Architect are limited in authority and responsibility as defined in the General Conditions.

1.4 Contractor: The individual, corporation, company, partnership, firm or other organization that has contracted to perform the Work under the Contract with the Owner.

1.5 Subcontractor: A person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. There shall be no direct contractual relationship between the Owner and any Subcontractor.

1.6 Project: All of the Work defined by the Contract Documents. 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 or by separate contractors.

1.7 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.

1.8 Day: A calendar day beginning and ending at 12:00 midnight, unless otherwise specifically stipulated.

1.9 Contract Sum: The total compensation payable to the Contractor for performing the Work as originally contracted for, or as subsequently adjusted by Change Order or other Contract Modification.

1.10 Substantial Completion: Jointly certified by the Architect/Engineer, Owner and Contractor as the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents, and approvals from regulatory agencies have been received, so that the Owner can occupy or utilize the Work or the designated portion thereof for its intended use. This includes a fully-operational HVAC system with controls, security system, fire alarm system and PA system.

1.11 Pre-Final Inspection: The inspection conducted to determine that a Project or a portion thereof, is substantially complete.

1.12 Final Inspection: The inspection conducted to determine that all deficiencies found in the Pre-Final Inspection, or subsequently discovered, have been corrected and that it is appropriate to release retainage and/or make final payment.

1.13 Contract Time: Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, from the Notice to Proceed to Substantial Completion.

1.14 The Drawings: The graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.15 The Specifications: 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.

1.16 The Project Manual: A volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.17 Sub-subcontractor: A person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site.

ARTICLE 2

LAWS GOVERNING CONSTRUCTION

2.1 Compliance with Laws: In the performance of the Work, the Contractor shall comply with all applicable State and Federal laws including, but not limited to, laws concerned with labor, equal employment opportunity, safety, criminal history review, and minimum wages. The Contractor shall become familiar with, and at all times shall comply with and give notices required by all Federal, State and Local laws, ordinances, rules, regulations and lawful orders of public authorities which in any manner affect the performance of the Work, and shall indemnify and save harmless the Owner and its official representatives against any claim arising from violation of any such law, ordinance or regulation by the Contractor or by the Contractor's Subcontractors or employees. When requested, competent evidence of compliance with applicable laws shall be furnished.

2.1.1 The Contractor shall cooperate with city or other governmental officials at all times where their jurisdiction prevails. The Contractor shall secure and pay for all permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when proposals are received or negotiations are concluded.

2.1.2 Where the Underwriters' Laboratories have established standards and issued labels for a particular group, class, or type of equipment the Underwriters' Laboratories label shall be required on all equipment in that category.

2.1.3 These Contract Documents shall be governed and interpreted in accordance with the laws of the State of Texas, and shall be performable in Harris County, Texas.

2.2 Wage Rates: The Contractor is required to pay not less than the wage scale of the various classes of labor as shown on the "Prevailing Wage Rate Schedule" in the Supplementary Conditions to the General Conditions of the Contract provided by the Owner. The specified wage rates are minimum rates only, and the Owner will not consider any claims for additional compensation made by any Contractor because of payment by the Contractor of any wage rates in excess of the applicable minimum rate contained in the Contract Documents.

2.2.1 Pursuant to the provisions of Chapter 2258 of the Texas Government Code, the Contractor shall forfeit as a penalty to the Galena Park Independent School District sixty dollars ($60.00) for each laborer, workman or mechanic employed, for each calendar day, or portion thereof, such laborer, workman or mechanic is paid less than the stipulated minimum rates for any Work done under the Contract by the Contractor or by a Subcontractor or Sub-subcontractor under the Contractor.

2.2.2 The Contractor is responsible for compliance with the prevailing wage laws in accordance with the Owner's Prevailing Wage Rate Schedule and associated Standard Job Classifications. The Owner reserves the right to conduct on-site interviews with construction workers in order to verify compliance.

2.2.3 All workers shall be classified in one of the job classifications in the Prevailing Wage Rate Schedule. The Contractor shall notify each worker commencing work on the Project of the worker's job classification and the established wage rate required to be paid. The notice must be delivered in writing to the employee, with copies to the Owner, and must list both monetary wages and fringe benefits to be paid for each classification in which the worker is assigned duties.

2.2.4 Competent evidence of compliance with the applicable laws and the Owner's Prevailing Wage Rate Schedule shall be furnished by the Contractor in the form of certified payroll reports submitted monthly in a form acceptable to the Owner.

2.2.5 The Contractor shall post the Prevailing Wage Rate Schedule at the Project construction site in a conspicuous location and maintain the posting throughout the construction period to ensure that all workers have access to wage rate information.

2.3 State Sales and Use Taxes: The Owner qualifies for exemption from state and local sales and use taxes pursuant to the provisions of the Texas Limited Sales, Excise and Use Tax Act (Taxation - General, Article 20.04, Vernon's Texas Civil Statutes). The Contractor shall claim exemption from payment of applicable State taxes by complying with such procedures as may be prescribed by the State Comptroller of Public Accounts. The Owner shall forward an executed copy of the GPISD Tax Exemption Certificate with the fully executed Owner/Contractor Agreement.

2.4 Antitrust Claims: The Contractor shall assign to the Owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Secs. 1 et seq (1973).

ARTICLE 3

CONTRACT DOCUMENTS AND BONDS

3.1 Copies Furnished: Drawings and the Project Manual: Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of the Drawings and the Project Manual as are reasonably necessary for execution of the Work.

3.2 Ownership of Contract Documents: All Contract Documents and copies thereof furnished by the Owner are and shall remain property of the Owner. In making copies of the Documents available the Owner does so only for the purpose of prosecution of the Work and does not confer a license or grant permission for any other use of the Documents. They are not to be used on any other Project and, with the exception of one Contract set for each party to the Contract, are to be returned to the Owner upon request following completion of the Work.

3.3 Contract Documents at the Site: The Contractor shall maintain in good order at the site one complete copy of all Contract Documents including Drawings, Project Manual, Addenda, Change Orders and other Contract Modifications, as well as a complete file of reviewed shop drawings and other technical submittals. The Contractor shall at all times give the Owner or its representatives and agents access thereto.

3.4 Record Documents: The Owner shall furnish to Contractor one set of "Xerox" Construction Drawings for the purpose of Record Documents. The Contractor shall maintain Record Documents and technical submittals (including shop drawings) which are marked to reflect the as-constructed conditions and representations of the Work performed, whether it be directed by Addendum, Change Order or other Contract Modifications. The as-constructed Record Documents and technical submittals shall also record accurately and dimensionally the locations of concealed elements of construction which are not specifically and dimensionally located in the original Contract Documents, particularly piping and equipment for utility, mechanical, electrical, plumbing and special systems. All records prescribed herein shall be made available for reference and examination by the Owner and its representatives and agents. The Contractor shall update the as-constructed Record Documents monthly prior to submission of periodic Applications for Payment. Failure to maintain such records shall constitute cause for denial of an Application for Payment otherwise due. Prior to the date of Substantial Completion, the Contractor shall deliver to the Architect/Engineer one complete set of as-constructed Record Documents which the Architect/Engineer shall review and (if found acceptable) shall then use in preparing final electronic Record Documents for the Owner.

The Contractor shall submit the Galena Park ISD Subcontractor Progress Assessment Form with each application for payment requesting payment be made for Work performed by a subcontractor that qualifies as a "small business" pursuant to GPISD Board Policy CV (Local). The Contractor shall also ensure that, once Contractor makes the applicable payment to the Small Business Subcontractor, the Subcontractor completes the Galena Park ISD Subcontractor(s)/Subcontractor(s) Supplier(s) Payment Certification Form in its entirety and Contractor agrees to submit the completed copies to Owner with the next application for payment. The completed Galena Park ISD Subcontractor(s)/Subcontractor(s) Supplier(s) Payment Certification Form must be received by the Owner before any further payment will be made to Contractor for any Work performed.

3.5 Performance and Payment Bonds: Performance and Payment Bonds are not required on contracts of less than $25,000.00. If the total Contract Sum equals or exceeds $25,000.00, then the Contractor shall execute (in accordance with the provisions of Section 2253.021 of the Government Code) the following bonds to the Owner: (1) Performance Bond in the amount of the total Contract Sum conditioned upon the faithful performance of the Contract. Said bond shall be solely for the protection of the Owner. (2) Payment Bond in the amount of the total Contract Sum solely for the protection of those supplying labor, materials and/or equipment in

the prosecution of the Contract. Additional requirements and instructions for preparation and submittal of Performance and Payment Bonds may be stipulated elsewhere in the Contract Documents.

3.5.1 Each bond shall be executed by a corporate surety or corporate sureties duly authorized to do business in the State of Texas, acceptable to the Owner, and on forms provided by the Owner. If any surety upon any bond furnished in connection with the Contract becomes insolvent, or otherwise not authorized to do business in this State, then the Contractor shall promptly furnish equivalent security to protect the interests of the Owner and of persons supplying labor, materials, and/or equipment in the prosecution of the Work contemplated by the Contract.

3.5.2 Each bond shall be accompanied by a valid Power-of-Attorney (issued by the surety company and attached, signed and sealed with the corporate embossed seal) authorizing the agent who signs the bond to commit the company to the terms of the bond, and stating (on the face of the Power-of-Attorney) the limit, if any, in the total amount for which the agent is empowered to issue a single bond.

3.6 Interrelation of Contract Documents: The interrelation of the Drawings and the Project Manual is as follows: The Project Manual establishes standards of design, quality, function and performance of several materials; the Drawings establish the locations, quantities, dimensions and details. Anything mentioned in the Project Manual and not shown on the Drawings, or shown on the Drawings and not mentioned in the Project Manual, shall be of like effect as if shown or mentioned on both.

3.6.1 Should the Drawings disagree one with another, or with the Project Manual, the better quality or greater quantity of Work or materials shall be performed or furnished. Figures and measurements given on larger scale drawings shall govern smaller scale drawings. In case of discrepancy either in the figures, in the Drawings, or in the Project Manual, the matter shall be promptly submitted in writing by the Contractor to the Architect/Engineer with a copy to the Owner. The Architect/Engineer shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at the Contractor's own risk and expense.

3.6.2 Any "Scope of Work" or "Work Included" statement placed in a Section of the Project Manual is intended to designate in general terms the types of Work to be performed. It is not intended to limit or to define the extent of the Work.

3.6.3 The location or grouping of Drawings and the placement of the Project Manual into Divisions and Sections is only for the convenience of referencing and relating like or similar types of Work. It is not intended to establish trade jurisdictions or to define or limit Work to be subcontracted. The prosecution and completion of all Work required by the Contract Documents is the responsibility of the Contractor.

3.7 Tax ID Form: Contractor shall provide to the Owner a copy of the executed notification of Tax ID Form W-9 prior to submitting the first Application for Payment.

ARTICLE 4

CONTRACT ADMINISTRATION

4.1 General Administration: Unless otherwise provided for in the Contract Documents, the Architect/Engineer will provide general administration of the Contract and will be the Owner's representative during construction and until final payment.

4.1.1 The Owner assumes no responsibility for any understanding given or representation made orally by its agents prior to the execution of this Contract, unless such understanding or representation is expressly stated in the Contract. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor. Any failure by the Contractor to become acquainted with available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the Work or mutually agreed changes thereto.

4.1.2 The Architect/Engineer has the authority to act on behalf of the Owner to the extent provided for in the Contract Documents, unless otherwise modified by written instrument which will be shown to the Contractor. The Architect/Engineer will advise and consult with the Owner.

4.1.3 The Owner's written instructions to the Contractor will generally be issued through the Architect/Engineer, except that the Owner reserves the right on appropriate occasions to issue instructions directly to the Contractor or through other designated representatives. All written communications concerned with the construction of the Project shall be furnished to the Owner, the Owner's designated agents and representatives, the Architect/Engineer, and the Contractor by the party originating the communication. All oral messages to or from the Contractor shall be given through the Owner's designated representative. The Contractor is responsible for complying with the Owner's administrative requirements set forth in these General

Conditions and stated elsewhere in the Contract Documents.

4.1.4 All oral instructions affecting Contract Sum, Contract Time or Contract interpretation, shall be confirmed promptly in writing with copies furnished to the Architect/Engineer, the Owner's designated representatives, and the Contractor by the party issuing the instruction.

4.1.5 No instructions affecting the Architect/Engineer's design liability shall be issued without the Architect/Engineer's prior written consent.

4.1.6 The Owner's representative, and the Architect/ Engineer with the Owner's consent, shall interpret the Contract requirements and have the authority to reject Work performed by the Contractor, which in the opinion of the Owner's representative or the Architect /Engineer does not meet the requirements of the Contract and to order such Work removed and replaced in accordance with paragraph 5. 11.

4.2 Subcontracts: The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms, conditions and requirements of the Contract Documents. Further, the Contractor shall fully inform all Subcontractors prior to executing an agreement with them that they will be required to perform their Work in conformance with the Contract Documents, and to submit cost estimates and change proposal requests in complete and full analytical detail per Paragraph 6.7.

4.2.1 The Contractor shall defend, indemnify and save harmless the Owner for any Subcontractor's claim which may result from the failure of the Contractor to incorporate the provisions of this Contract into any of the Contractor's subcontracts.

4.2.2 After the execution of the Contract, a change in any accepted Subcontractor or the addition of any new Subcontractor can only be made with the written consent of the Owner.

4.2.3 Re: Pre-Approved Sub-Contractors per the Supplementary Conditions.

4.3 Access to and Inspection of the Work: The Contractor shall provide sufficient, safe and proper facilities at all reasonable times for observation and/or inspection of the Work by authorized representatives of the Owner. The Architect/Engineer and the Owner will make periodic visits to the site to familiarize themselves with the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. The presence of the Owner or his representative at the Project site does not imply concurrence with or approval of the Work.

4.4 Separate Contracts: The Owner reserves the right to award other Contracts in connection with other portions of the Project under these or similar conditions of the Contract.

4.4.1 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 signs each separate Owner-Contractor Agreement. The Contractor for this Contract shall properly connect and coordinate the Work of this Contract with the Work of other Contractors. If any part of this Contractor's Work depends on proper execution or proper results on the Work of any other separate Contractor, this Contractor shall inspect and promptly report in writing to the Architect/Engineer any discrepancies or defects which the Contractor may find in such other Work that render it unsuitable for such proper execution or results. Failure of this Contractor to so inspect and report shall constitute an acceptance of the other Contractor's Work as fit and proper to receive the Work of this Contract, except as to defects which may develop in the other separate Contractor's Work after the execution of this Contractor's Work.

4.4.2 Should this Contractor cause delay or cause damage to the Work or property of any separate Contractor on the Project, this Contractor shall, upon due notice, endeavor to settle with such other Contractor by agreement. If such separate Contractor sues the Owner on account of any damage alleged to have been so sustained, then the Owner shall notify this Contractor who shall defend such proceedings and pay all costs in connection therewith and, if any judgment against the Owner arises there from, this Contractor shall pay or satisfy it.

4.4.3 This Contractor shall afford the Owner and/or other contractors reasonable opportunity for the introduction and storage of their materials and equipment, and for the execution of their Work, and for proper connection to and coordination with this Contractor's Work.

4.4.4 The Owner reserves the right to make essential installations which are pertinent to the use of the building or Project prior to Substantial Completion. Within this right the Owner may let other Contracts or may do such Work with its own labor forces and materials. The Contractor shall not commit or permit any act which will interfere with the performance of Work by any other Contractor or supplier, or by Owner's employees. The Contractor shall cooperate to the end that the Owner may

realize complete functioning of the building or Project on the day of Substantial Completion.

4.5 Contract Termination:

4.5.1 Termination by Contractor. If the Work is stopped for a period of ninety (90) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act of fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a Contract with the Contractor, then the Contractor may, upon ten (10) additional days written notice to the Owner and the Architect/Engineer, terminate the Contract and recover from the Owner payment for all Work executed and for any loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and overhead associated with such Work for losses and reasonable expenses resulting from such termination. If the cause of the Work stoppage is removed prior to the end of the ten (10) day notice period, the Contractor may not terminate the Contract.

4.5.2 Termination by Owner. If the Owner determines that the Contractor is adjudged as bankrupt, or if the Contractor makes a general assignment for the benefit of the Contractor's creditors, or if a receiver is appointed on account of the Contractor's insolvency, or if the Contractor persistently or repeatedly refuses or fails (except in cases for which extension of time is provided) to supply enough properly skilled workmen or proper materials, or if the Contractor persistently performs substandard Work, or persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or is otherwise guilty of a substantial violation of a provision of the Contract Documents, or fails to so prosecute the Work as to insure its completion (within the time, or any extension thereof, specified in this Contract), then the Owner may, without prejudice to any right or remedy, and after giving the Contractor and the Contractor's surety (if any) ten (10) days written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor. Should the surety fail to respond within fifteen (15) days following such notice and to pursue completion of the Work with diligence acceptable to the Owner, the Owner may arrange for completion of the Work and deduct the cost thereof from the unpaid balance of the Contract Sum, including the cost of additional Architect/Engineer services and Owner Contract administration costs made necessary by such default or neglect, in which event no further payment shall then be made by the Owner until all costs of completing the Work shall have been paid. If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the

Architect/Engineer's additional services made necessary thereby, then such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, then the Contractor or the Contractor's surety shall pay the difference to the Owner. If the Owner sues the Contractor or Surety on account of failure to pay such difference in cost upon demand, then the Contractor and Surety will pay all costs in connection therewith, including reasonable attorney's fees. This obligation for payment shall survive the termination of the Contract.

4.5.3 Termination for Convenience of Owner: Prior to or during the performance of the Work, the Owner reserves the right to terminate the Contract for convenience or unforeseen causes that may occur. Upon such occurrence, the following procedures will be adhered to:

4.5.3.1 The Owner will immediately notify the Architect/Engineer and the Contractor in writing, specifying the effective termination date of the Contract.

4.5.3.2 After receipt of the notice of termination, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due at that point in the Contract.

.1 Stop all Work.
.2 Place no further subcontracts or orders for materials or services.
.3 Terminate all existing subcontracts.
.4 Cancel all existing materials and equipment orders as applicable.
.5 Take all actions necessary to protect and preserve all property related to this Contract which is in the possession of the Contractor.

4.5.3.3 Within 180 days of the date of the notice of termination, the Contractor shall submit a final termination settlement proposal to the Owner based upon costs up to the date of termination, reasonable profit on Work done only, and reasonable demobilization costs. If the Contractor fails to submit the proposal within the time allowed, then the Owner may determine the settlement amount, and shall pay the determined amount to the Contractor.

4.5.3.4 If the Contractor and the Owner fail to agree on the settlement amount, then the matter will be handled as a dispute in accordance with the procedure described in Subparagraph 5.2.1.

4.6 Written Notice: Written notice shall be considered to have been duly given if delivered in person to the individual or member of the firm or to an officer of the corporation for whom it is intended, or if delivered to, or sent by registered or certified mail to, the last business address known to the one who gives the notice.

4.7 Disputed Matters: Disputed matters shall be handled through administrative procedures as established in Subparagraph 5.2.1.

ARTICLE 5

CONTRACT RESPONSIBILITIES

5.1 Owner's Responsibilities: The Owner shall furnish all surveys describing the physical characteristics, legal description and limitations, site utility locations and other information necessary to the Contractor which are under the Owner's control.

5.1.1 Communication with the Contractor shall be in accordance with Paragraph 4.1.

5.1.2 Necessary actions of the Owner, including processing of payments to the Contractor, shall be accomplished with reasonable promptness and subject to Government Code, Chapter 2251, Subchapter B.

5.2 Owner-Contractor Obligations: The Owner and the Contractor each bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due, or to become due hereunder, without the previous written consent of the Owner.

5.2.1 Disputes: Except as otherwise provided in this Contract, any dispute concerning a question of fact arising under this Contract, which is not disposed of by the Owner-Contractor Agreement, shall be decided by the Owner (as represented by the Assistant Superintendent for Support Services) who shall reduce a decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Owner shall be final and conclusive unless, within 30 days from the date of receipt of such written decision, the Contractor mails or otherwise furnishes to the Owner a written appeal addressed to the Superintendent, Galena Park Independent School District. If the decision on the appeal is adverse, then the Contractor may, within 30 days from the receipt of such decision, make further appeal to the Board of Trustees of the Galena Park Independent School District whose decision shall be final and conclusive. In connection with any appeal under this Subparagraph, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of the Contractor's appeal to a person or persons appointed by the Board of Trustees for such purpose. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Owner's decision. Both parties agree that any decision of fact reached by the process in this Subparagraph 5.2.1 shall be contractually binding upon them and shall become a part of this Contract.

5.3 Contractor's Responsibilities: The Contractor shall supervise, coordinate and direct the Work using the Contractor's best skill and attention to assure that each element of the Work conforms to the requirements of the Contract Documents. The Contractor shall be solely responsible for and have control over all construction means, methods, techniques, safety, sequences and procedures, and for coordinating all portions of the Work under the Contract.

5.3.1 The Contractor is obligated to notify the Architect/Engineer, in writing, when 1) the Contractor is in disagreement with any items, details, methods, or specifications, or 2) if the Contractor has reason and can provide evidence that an element of the Work will not function properly or safely, or will not deliver appropriate service and durability if such item is provided in accordance with the Contract Documents. Such matters will be clarified in writing by the Architect/Engineer prior to their incorporation into the Project.

5.3.2 The Contractor's Superintendent shall prepare daily reports indicating all work in progress, listing all Subcontractors and crews working on site, and listing all material and equipment delivered to site. Provide copies of daily reports to Owner at progress meetings.

5.4 Contractor's Superintendent: The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the Project site from the Notice to Proceed to completion of all punch list items attached to the Certificate of Substantial Completion. The Superintendent shall not be a foreman working on the Project; shall be an individual satisfactory to the Owner; and shall not be changed without the written approval of the Owner (except if the Superintendent leaves the employment of the Contractor). The Superintendent shall represent the Contractor and shall have full authority to act on the Contractor's behalf. All communications given to the
Superintendent shall be as binding as if given to the Contractor.

5.5 Acts and Omissions: The Contractor shall be responsible for acts and omissions of the Contractor's employees, of the Contractor's Subcontractors, their agents and employees and of other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors. . The Owner may, in writing, require the Contractor to remove from the Work any employee that the Owner's designated representative or agent finds careless, incompetent or otherwise objectionable.

5.6 Conditions at Site or Building: The Owner makes no representations as to the accuracy or completeness of the site information furnished to the Contractor by Owner; does not expressly or impliedly warrant same; and is not responsible for any interpretations or conclusions reached by the Contractor with respect thereto. It is the Contractor's sole responsibility to verify (to the Contractor's own satisfaction) all site information including, but not restricted to, topographical data, borings, subsurface information, utilities and easements.

5.6.1 The Contractor is responsible for having visited the site and having ascertained pertinent local conditions such as locations, accessibility, and general character of the site or building, the character and extent of existing Work within and adjacent to the site, and any other Work being performed thereon. Any failure to do so will not relieve the Contractor from responsibility for successfully performing the Work without additional expense to the Owner.

5.6.2 If, in the performance of the Contract, concealed, subsurface or latent conditions at the site are found to be materially different from the information included in the proposed Contract Documents; or if unknown conditions of an unusual nature are discovered which differ materially from the conditions usually inherent in Work of the character shown and specified, then the Architect/Engineer shall be notified in writing of such conditions before they are disturbed. Upon such notice, or upon the Architect/Engineer's own observation of such conditions, the Architect/Engineer, with the approval of the Owner, will promptly make such changes in the Contract Documents as the Architect/Engineer deems necessary to conform to the different conditions. Any increase or decrease in the cost of the Work or in the time within which the Work is to be completed,
resulting from such changes will be adjusted by Change Order, subject to the prior approval of the Owner.

5.7 Insurance

5.7.1 The Contractor shall not commence any portion of the Work under this Contract until the Contractor has obtained all the insurance required hereunder and Certificates of Insurance and Policy have been filed with and reviewed by the Owner. Acceptance of the insurance certificates by the Owner shall not relieve or decrease the liability of the Contractor.

.1 This section shall govern the entire Contract.

.2 The insurance shall contain a provision that at least thirty days prior written notice shall be given to the Owner in the event of cancellation, material change or non-renewal.

.3 Insurance shall be underwritten by a company rated not less than B + VII in Best's latest published guide.

.4 There shall be a hold harmless agreement in which the Contractor assumes liability on the Contract and holds the School District harmless.

.5 The Contractor shall purchase and maintain in force the following kinds of insurance and bonds for operations under construction contracts and as specified in each section.

5.7.2 Casualty Insurance - Unless otherwise provided for in the Supplementary Conditions, the Contractor shall provide and maintain (until the Work covered in this Contract is completed and accepted by the Owner) the minimum insurance coverages as follows:

.1 Workmen's Compensation shall be furnished for all employees as follows:

A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a Project is required for the duration of the Project.

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.

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, Subcontractors, 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.

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.

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 401.011(44) for all employees of the Contractor providing services on the Project for the duration of the Project.

The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the Contract.

If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, then 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.

The Contractor shall obtain from each person providing services on a Project, and provide to the governmental entity:

1. A certificate of coverage, prior to that person beginning work on the Project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the Project; and
2. No later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

The Contractor shall retain all required certificates of coverage for the duration of the Project and for one year thereafter.

The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten 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.

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.

The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:

1. Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which 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;
2. 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;
3. 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.
4. Obtain from each other person with whom it contracts, and provide to the Contractor:
    a. A certificate of coverage, prior to the other person beginning work on the Project; and
    b. A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
5. Retain all required certificates of coverage on file for the duration of the Project and for one year thereafter;
6. Notify the governmental entity in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and
7. Contractually require each person with whom it contracts to perform as required by items 1-6, with the certificates of coverage to be provided to the person for whom they are providing services.

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.

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 days after receipt of notice of breach from the governmental entity.

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)

5.7.3 Commercial General Liability Insurance (Occurrence Basis Only)

5.7.3.1 The Owner shall be named additional insured on the Contractor's policy with waiver of subrogation as to the subject job.

5.7.3.2 Bodily injury and property damage:

1. Each Occurrence $1,000,000
2. General Aggregate $2,000,000
3. Products/Completed Operations
   a. Aggregate $1,000,000
4. Personal and Advertising Injury
   a. Occurrence $1,000,000
5. Fire Damage, Legal Liability
   a. Any One Fire $50,000
6. Medical Expenses
   a. Any One Person $5,000

5.7.4 Business (Commercial) Automobile Liability Insurance All Owned, Non-Owned, and Hired Coverage

1. Automobile Liability $l,000,000
2. The Owner shall be named additional insured on the Contractor's policy with waiver of subrogation as to the subject job.

5.7.5 Deletions and Exclusions

1. No deletions/exclusions from standard coverage forms shall be permitted, without the written consent of the Owner for Commercial General Liability Insurance or Business (Commercial) Automobile Liability Insurance.

5.7.6 Umbrella Liability Insurance

.1 Umbrella shall be issued as "Follow Form Policy".

.2 This policy shall provide coverage over the Workmen's Compensation, Commercial General Liability, and Business (Commercial) Automobile Liability (Covering All Owned, Non-Owned, and Hired Vehicles.)

5.7.7 Builder's Risk Insurance:

The Contractor shall obtain at the Contractor's expense, All Risk Property Insurance coverage, acceptable to the Owner, in the amount of insurance equal at all times to the insurable value of materials delivered and labor performed. The policy so issued in the name of the Contractor shall also name all Subcontractors and the Owner as additional insured, as their respective interests may appear. The policy shall have endorsements as follows: "This insurance shall be specific as to coverage and not considered as contributing insurance with any permanent insurance maintained on the present premises."

.1 The policy shall be written in the name of the Owner and Contractor as their interest may appear.
.2 The policy shall be written on all risk basis for physical loss or damage and include the vandalism, malicious mischief.
.3 The amount of coverage shall be for the full insurable value of Work.
.4 The deductible shall not be over $1,000.00 without approval of the Owner. (Deductible losses shall be paid by the Contractor.)
.5 The policy shall include an endorsement allowing Owner occupancy, and the insurance shall not be canceled or altered on account of partial occupancy prior to completion.
.6 The original Builder's Risk Policy shall be furnished to the Owner prior to start of the job. This shall be a "Stand Alone" Policy.
.7 The Policy shall include $500,000 extra expense.

5.8 Safety Precautions and Emergencies:

5.8.1 It shall be the duty and responsibility of the Contractor and all of its Subcontractors to be familiar and comply with all requirements of Public Law 91-596 enacted by Congress, December 29, 1970, cited as the Occupational Safety and Health Act of 1970, and all amendments thereto, commonly referred to as OSHA, and to enforce and comply with all of the provisions of this

Act. The Owner reserves the right to enforce standard safety practices through the Contractor, which shall take immediate action when notified either orally or written of an unsafe condition.

5.8.2 In any emergency affecting the safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor resulting from response to an emergency shall be considered in accordance with Article 6 - Contract Changes.

5.9 Materials and Workmanship: All Work shall be executed in accordance with the Contract Documents, complete in all parts and in accordance with approved practices and customs, and of the best finish and workmanship. Unless otherwise specified, all materials and equipment incorporated in the Work under the Contract shall be new.

5.10 Tests: If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the Contractor shall give the Owner and the Architect/Engineer timely notice of its readiness and of the date arranged so that the Architect/Engineer may observe such inspection, testing or approval.

5.10.1 The Owner shall pay for all routine testing of materials agreed by the Architect/Engineer and the Owner to be required by the Contract Documents or to be in the best interests of the Owner. When retesting of material failing the initial test is required, the cost of retesting will be paid for by the Contractor. Any special testing which is specifically required in the scope of Work and specifically stipulated to be the responsibility of the Contractor in a technical section of the Project Manual shall be paid for by the Contractor.

5.10.2 Should testing of suspected non-compliant material or Work require that completed Work be removed to accomplish the testing, and further should the testing demonstrate that the material or Work fails to comply with the requirements of the Contract Documents, the Contractor shall bear all costs of the testing, inspection or approval as well as the cost of replacement of unsatisfactory material or Work as provided by paragraph 5.11. Should the testing demonstrate that the Work or material is in compliance, the Owner shall bear such costs and an appropriate Change Order shall be issued.

5.10.3 Material compliance with the Contract Documents shall be made by one of the following:

1. Manufacturer's certificate of compliance.
2. Mill certificate.
3. Testing laboratory certification.
4. Report of actual laboratory test from the Owner's laboratory or from a laboratory satisfactory to the Owner. Samples tested shall be selected by or in the presence of the Owner and the method of testing shall comply with the professional societies' standard specifications.

5.11 Removal of Defective Work: The Owner's representatives and the Architect/Engineer shall interpret the Contract requirements and shall be the final judge of the acceptability of the Work under the Contract Documents.

5.11.1 If any materials furnished under this Contract are judged to be not in compliance with requirements of the Contract Documents by the Owner and/or the Architect/Engineer, then the Owner and/or the Architect/Engineer will deliver to the Contractor a notification of such non-compliance in writing. The Contractor shall, after having received such written notice of non-compliance, proceed to remove from the grounds or buildings all materials (whether worked or unworked) and to take down all portions of the Work which the Owner and/or Architect/Engineer shall by such written notice condemn as unsound or improper or as in any way failing to conform to the requirements of the Contract Documents; and shall make good all Work damaged or destroyed thereby.

5.11.2 The Contractor shall, without charge, replace any material or correct any workmanship found by the Owner or Architect/Engineer not to conform to the requirements of the Contract Documents, unless in the public interest the Owner consents in writing to accept such material or workmanship with an appropriate adjustment in the Contract Sum. The Contractor shall promptly correct all Work rejected by the Owner or Architect/Engineer as defective or as failing to conform to the Contract Documents whether observed before or after the date of Substantial Completion or Final Inspection and acceptance and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work.

5.11.3 If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Owner may, 1) replace such materials or correct such workmanship and charge the cost thereof to the Contractor, or 2) terminate the Contractor's employment in accordance with Paragraph 4.5, Contract Termination.

5.11.4 If any portion of the Work is covered contrary to the instructions of the Owner or Architect/Engineer or to the requirements specifically expressed in the Contract

Documents, then it must be uncovered for observation or testing and recovered at the Contractor's expense without change in the Contract Time.

5.11.5 If any other portion of the Work is covered which the Owner or Architect/Engineer has not specifically requested to observe prior to being covered, then either may request to see such Work and it shall be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, then the cost of uncovering and recovering shall, by appropriate Change Order, be charged to the Owner. If such Work is found not to be in accordance with the Contract Documents, then the Contractor shall pay such costs.

5.12 Royalties Patents and Copyrights: The Contractor shall pay all royalties and license fees, and defend all suits or claims for infringement of any copyrights and patent rights; and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such royalties and license fees and loss when a particular design or process, or the product of a particular manufacturer or manufacturers is specified; provided, however, if the Contractor has reason to believe that the required design, process or product specified is an infringement of a copyright or a patent, then the Contractor shall be responsible for such royalties, license fees and loss unless the Contractor promptly gives information to the Owner and the Architect/Engineer.

5.13 Equivalent Materials: It is not the intent of these Contract Documents to limit materials to the product of any particular manufacturer. Where definite materials, equipment and/or fixtures have been specified by name, manufacturer or catalog number, it has been done to set a definite standard and a reference for comparison for quality, function, application, physical conformity, and other characteristics. It is not the intention to discriminate against or prevent any dealer, jobber or manufacturer from furnishing materials, equipment, and/or fixtures which meet or exceed the characteristics of the specified items as judged by the Owner and/or the Architect/Engineer. Substitution of materials shall not be made without prior written approval of the Owner and the Architect/Engineer.

5.13.1 The Contractor shall be responsible for any additional costs or delays resulting from having furnished materials, equipment or fixtures other than those specified or subsequently approved, and shall reimburse the Owner for any increased design costs resulting from such substitutions.

5.13.2 The Owner shall be the final judge of whether a proposed substitution meets or exceeds the characteristics of a specified item and decisions of the Owner relative to the equivalency of items proposed as substitutes for specified items shall be final and conclusive.

5.14 Technical Submittals:

5.14.1 Definition: Technical Submittals include Shop Drawings, Product Data, Installation Instructions, Samples, and other submittals which are typically related to construction materials, products, systems or services, and which are required by the Contract Documents.

5.14.1.1Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or any Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

5.14.1.2Product 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.

5.14.1.3Samples are physical examples furnished by the Contractor which illustrate materials, equipment or workmanship, and which establish standards by which the Work will be judged.

5.14.2 The Contractor shall submit within three (3) months after the date of the Notice to Proceed, and in orderly sequence, all Technical Submittals required by the Contract Documents, or subsequently required by the Architect/Engineer as covered by Contract modifications. The Contractor shall review them for compliance with Contract Documents and shall certify that the Contractor has done so by stamp, or otherwise, affixed to each copy thereof. Submittal data presented without such certification will be returned without review or other comment, and any delay resulting there from will be the Contractor's responsibility.

5.14.2.1The Contractor shall, within twenty (20) calendar days after receipt of the Notice to Proceed, submit to the Owner through the Architect/Engineer two (2) copies of a list of submittals, in a form acceptable to the Owner, which lists all Technical Submittals that are required by the Contract, and indicates which are to be reviewed and certified by the Contractor. The list shall then be reviewed and approved by the Owner and/or the Architect/Engineer.

5.14.2.1.1 The schedule shall include, but is not necessarily limited to, all Technical Submittals, certificates of compliance, material samples, material color charts or samples, guarantees, operation and

maintenance instructions, etc.

5.14.2.1.2 The schedule shall indicate the type of item, Contract requirements reference, the Contractor's scheduled dates for submitting the items, the projected need dates for approval from the Owner or the Architect/Engineer, and the projected or actual dates for procurement. The schedule shall show a minimum of fifteen (15) calendar days after receipt for review by the Owner and Architect/Engineer. If resubmittal is required, then an additional fifteen (15) days will be allowed for review after receipt. The Contractor will revise and/or update this schedule as appropriate, and submit same with each monthly Application for Payment.

5.14.2.1.3 The submittal schedule shall be coordinated with the Owner-reviewed, Contractor prepared and submitted construction schedule for all the Work. The Contractor shall revise and/or update the submittal schedule monthly to insure consistency with the construction schedule. The Owner shall be provided with two (2) copies of each revised submittal schedule.

5.14.3 Technical Submittals shall be properly identified, as specified or as the Owner and/or Architect/Engineer may require. At the time of submission, the Contractor shall inform the Owner and the Architect/Engineer in writing of any deviations in the Technical Submittals from the requirements of the Contract Documents.

5.14.4 By providing Technical Submittals, the Contractor thereby represents that the Contractor has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, or will do so; that the Contractor has checked and coordinated each Technical Submittal with the requirements of the Work and of the Contract Documents; and that the Contractor shall so certify as required by Subparagraph 5.14.2.

5.14.5 The Architect/Engineer and/or the Owner will review the Technical Submittals with reasonable promptness, but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The review of a separate item shall not indicate approval of an assembly in which the item functions. Review of the Technical Submittals shall not relieve the Contractor of responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has informed the Owner and the Architect/Engineer in writing of such deviations at the time of submittal and the Owner or the Architect/Engineer has not objected to the specific deviations. The approval shall not relieve the Contractor from responsibility for errors or omissions in the Technical Submittals.

5.14.6 The Contractor shall make any corrections required and shall resubmit the required number of corrected copies of the Shop Drawings or Product Data or new Samples of materials until accepted. The Contractor shall direct specific attention in writing to any new revisions other than the corrections requested on previous submissions.

5.14.7 No Work requiring a Technical Submittal shall be performed until the submittal has been reviewed. All such Work shall be in accordance with the reviewed Technical Submittal.

5.15 Cleaning: The Contractor shall at all times keep the premises and surrounding area clean and free from accumulation of waste materials or rubbish caused by the Work under this Contract. Upon completion of the Project, and prior to the Final Inspection, the Contractor shall have the premises in a neat and clean condition.

ARTICLE 6

CONTRACT CHANGES

6.1 Change Orders: A Change Order is a written order to the Contractor signed by the Owner, the Contractor and the Architect/Engineer, and issued after execution of the Contract which authorizes a change in the Work or an adjustment in the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in the Contract Sum or the Contract Time. It is recognized by the parties hereto and agreed by them that the Contract Documents may or may not be complete, or be free from errors, omissions and imperfections, or require changes or additions in order for the Work to be completed to the satisfaction of Owner. Accordingly, it is the express intention of the parties (notwithstanding any other provisions in this Contract) that any errors, omissions or imperfections in the Contract Documents, or any changes in or additions to same or to the Work ordered by Owner and any resulting delays in the Work or increases in Contractor's costs and expenses, shall not constitute or give rise to any claim, demand or cause of action of any nature whatsoever in favor of Contractor, whether for breach of Contract, quantum merit, or otherwise. However, the Owner shall be liable to the Contractor for the sum stated to be due the Contractor in any Change Order approved and signed by all parties. It is agreed hereby that such sum, together with any extension of time contained in said Change Order, shall constitute full compensation to the Contractor for all costs, expenses and damages to the Contractor, whether direct, consequential or otherwise in any wise

incident to, arising out of, or resulting directly or indirectly from the Work performed by the Contractor under such Change Order.

6.1.1 The Owner, without invalidating the Contract and without approval of the Surety, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order or Construction Change Directive and shall be performed under the applicable conditions of the Contract Documents.

6.1.1.1 Any other written order or oral order (which terms as used in this paragraph shall include direction, instruction, interpretation, or determination) from the Architect/Engineer or Owner shall be treated as a Change Order under this clause only if the Contractor gives the Owner written notice within twenty (20) days stating the date, circumstances, source of the order and that the Contractor regards the order to be a Change Order.

6.1.1.2 The Owner may, in writing, issue a Notice to Proceed for any portion of the Work in a Change Order for which final adjustment in Contract Sum and/or Contract Time has not been finalized. The Notice to Proceed letter may have a not-to-exceed cost amount for any or all portions of the Change Order. This amount is not to be exceeded without prior written approval by the Owner.

6.1.2 If the Contractor intends to assert a claim for an adjustment of cost or time over and above any adjustment already granted in a Change Order, then the Contractor must (within twenty (20) calendar days after receipt of a written Change Order, or receipt of oral or written order to proceed with a proposed change under Clause 6.1.1.2, or after the furnishing of a written notice under Clause 6.1.1.1) submit to the Owner a written statement setting forth in detail the nature and monetary extent of such claim as per Paragraph 6.3. The Contractor shall certify that the claim is made in good faith and that the supporting data is current, accurate and complete to the best of the Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Owner is liable. Failure to certify a claim will result in a determination that no claim has been filed. The thirty (30) day period of time for submission of such claim may be extended only by written agreement signed by the Owner. Except for claims based on defects in drawings or specifications furnished by the Owner, no claim for any change under Subparagraph
6.3.1 shall be allowed for any costs incurred more than twenty (20) days before the Contractor gives written notice as therein required; provided that, in the case of claims based on defects in drawings or specifications furnished by the Owner, the adjustment in cost shall include only those increased direct costs reasonably and necessarily incurred by the Contractor as a result of such defective drawings or specifications.

6.1.3 Except as provided above, no order, oral statement, or direction of the Owner or the Owner's duly appointed representative shall be treated as a change under this Article or entitle the Contractor to an adjustment thereunder.

6.1.4 The Contractor agrees that the Owner or any of its duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers, and records of the Contractor. Further, the Contractor agrees to include and submit evidence that all of its subcontracts include a provision to the effect that the Subcontractor agrees that the Owner or any of its duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers and records of such Subcontractor relating to any claim from the Contract, whether or not the Subcontractor is party to the claim. The period of access and examination described herein which relate to appeals under Subparagraph 5.2.1, litigation, or the settlement of claims arising out of the performance of this Contract shall continue until final disposition of such claims, appeals or litigation.

6.2 Unit Prices: If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the Owner or the Contractor, then the applicable unit prices shall be equitably adjusted as provided herein.

6.2.1 Each unit price proposed by the Contractor shall include all costs applicable to the Work including, but not limited to, mobilization, demobilization, labor, materials, equipment, supervision, delays, overhead at any level, and profit.

6.2.2 Either party may request an equitable adjustment. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred and fifteen percent (115%) or below eighty-five percent (85%) of the originally specified amount. If the quantity variation causes an increase in the time necessary for completion, then the Owner (upon receipt of a written request for an extension of time within thirty (30) days from the recognition of the variation or

within such further period of time as may be granted by written agreement signed by the Owner) will ascertain the facts and make such adjustment for changing the completion date as in its judgment the findings justify.

6.3 Claims for Additional Costs:

6.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum, then the Contractor shall give the Owner and the Architect/Engineer written notice thereof within thirty (30) days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Subparagraph 5.8.2. No such claim shall be valid unless so made and the Contractor hereby waives all claims for which such notice is not given. If the Owner and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by administrative procedures as provided in Subparagraph 5.2.1. Any changes in the Contract Sum resulting from such claim shall be authorized by Change Order.

6.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation of the Contract Documents, (2) any order by the Owner to stop the Work pursuant to Subparagraph 4.5.3 where the Contractor was not at fault, (3) any written order for a minor change in the Work issued pursuant to Paragraph 6.5, then the Contractor shall make such claim as provided in Subparagraph 6.3.1 in a timely manner which will not have an effect on the construction schedule.

6.3.3 Any claim shall contain the following elements: (1) an analysis of the relevant Contract provisions, (2) a description of the facts, (3) a statement of why the particular facts warrant compensation under the terms of the Contract, (4) supporting cost or pricing data per Paragraph 6.7, (5) legal analysis, if appropriate, (6) expert opinion, if appropriate, (7) certification per Subparagraph 6.3.4**,** and (8) a formal request for decision. All direct costs should be accurately presented in the claim, i.e., labor should come from payrolls, equipment from equipment reporting forms and materials should be based on invoices.

6.3.4 The Contractor shall certify that the claim is made in good faith, that the supporting data is current, accurate and complete to the best of the Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Owner is liable.

6.3.5 Failure to certify the claim will result in a determination that no claim has been filed.

6.4 Claims for Additional Time: If a change in the Work causes an increase or decrease in the Contract Time, then the Contractor's proposal shall include a reasonable estimate of such increase or decrease based on effects of the Change Order to critical path activities. Any costs associated with a change in the Contract Time is included in the fifteen percent (15%) mark-up.

6.5 Minor Changes: The Architect/Engineer, with concurrence of the Owner, will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time. Such changes shall be effected by written order which the Contractor shall carry out promptly.

6.6 Bar to Claims: No claim shall be allowed for an adjustment under this or any other provision of the Contract if asserted after final payment under this Contract.

6.7 Administrative Procedures for Change Orders: If a change in the Work will result in an increase or decrease in the Contract Sum, then the Owner shall have the right to require the performance thereof on a lump sum basis, a unit price basis or a time and material basis, all as hereinafter more particularly described (the right of the Owner as aforesaid shall apply with respect to each such change in the Work).

6.7.1 Lump Sum Proposal: In responding to a request for a proposed price for a change in the Work, or in submitting a claim, the Contractor shall furnish a lump sum proposal supported by a complete breakdown as described hereafter, indicating the estimated or actual cost to the Contractor for performance of the changed Work, including the applicable percentage of overhead and profit described hereafter. Any request for a time extension must be justified and presented in adequate detail to permit evaluation per Article 8, showing that the proposed change will delay the final Contract Completion Date.

6.7.1.1 A Lump Sum Proposal for the adjustment of Work shall contain the following items:

.1 Estimated cost, using any discount to the trades, of the materials and supplies used, which shall be itemized completely to include unit cost, quantity and total cost.

.2 The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub-subcontractors, may include reasonably anticipated direct wages of jobsite labor

(including foremen) who will be directly involved in the change in the Work (for such time as they will be so involved). In addition to the direct wages, payroll costs including Social Security, Federal/State Unemployment Insurance and like taxes may also be included. These payroll costs shall be itemized separately; and the Contractor shall provide verifying documentation of these costs. Furthermore, any fringe benefits required by applicable union/trade agreements in connection with such direct wages may also be included if the Contractor provides verifying documentation of these benefits.

.3 Estimated cost to the Contractor for additional construction equipment used solely on the Change Order, to include rental rates or owned equipment rates for such items of equipment while in use, which shall be itemized completely to include type(s), the number(s) of each, hourly rate, hours and total cost. Equipment which is regularly used at the job shall be used in Change Order Work at no extra charge. Rental or owned equipment rates shall be no greater than those established by the Association of General Contractors for the local area. As used herein the terms "construction equipment" and "equipment" shall include wheeled vehicles and small tools.

.4 Estimated transportation costs for delivery and handling of materials and supplies, bringing to and removing from the site additional construction equipment and/or new items of installed equipment, if applicable, which shall be itemized separately.

.5 Estimated off-site storage costs in excess of thirty (30) calendar days for new items of installed equipment, if applicable.

.6 To the Contractor's, Subcontractor's or Sub-subcontractor's cost proposal for Work performed by its own forces, a markup of fifteen percent (15%) shall be added to cover all elements of overhead and profit including, but not limited to, supervision above the level of foremen, estimating, scheduling, procurement, cleanup, temporary facilities, consumables, safety, quality control/assurance, protection, security, small tools, radios, company vehicles, home and branch office costs and expenses of any type whatsoever. To the Contractor's cost proposal five percent (5%) shall be added to the Subcontractor's or Sub-subcontractor's cost proposal to cover processing and management of the added Work. If any of the items included in the lump sum proposal are covered by unit prices contained in the Contract Documents, then the Owner may, if it requires the change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum proposal. In this event an appropriate deduction will be made in the lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.

.7 To the summary of the Contractor's proposed cost, the direct cost for insurance and bonds shall be added upon the Contractor providing documentation.

6.7.2. In cases where changes in the Work result in a credit to the Owner, the credit shall be limited to direct costs; that is, no overhead or profit shall be applied to such costs. In cases where a change in the Work results in both credits and charges to the Owner, the Contractor will be allowed to add the overhead and profit percentages indicated in Clause 6.7.1.1 to the net charge based upon the amount by which the total charges exceed the total credits; if there is a net credit, then no overhead or profit shall be charged.

6.7.3 Time and Material Proposal: If the Owner elects to have the change in the Work performed on a time and material basis, the same shall be performed, whether by the Contractor's forces or the forces of its Subcontractors or Sub-subcontractors, at actual cost to the entity performing the change in the Work plus the same markups for overhead and profit as set forth in Clause 6.7.1.1. The Contractor shall submit to the Owner daily time and material tickets which shall include the identification number assigned to the change in the Work, the classification of labor employed (and names and social security numbers), the materials used, the equipment rented (not tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all time and material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not constitute an acknowledgement by the Owner that the items thereon were reasonably required for the change in the Work.

6.7.4 Submission Time: Contractor's proposals for changes in the Contract Sum or Contract Time for Change Order Work shall be submitted within fourteen (14) calendar days of the Owner's or A/E's written request for same, unless the Owner or A/E extends such period of time due to the circumstances involved. If such proposals are not timely received, or if the changed Work should start immediately to avoid damage to the Project or to

avoid a delay, then the Owner may (at its discretion and in the interest of prosecuting the Work to timely completion) direct the Contractor to proceed with the changed Work. In this case the Owner shall direct the Contractor in writing to proceed with the Work on a time and material basis in compliance with Paragraph 6.7.3. This directive shall be known as a "PDL-NTE" (Price Determined Later - Not To Exceed). If such directive is given orally to the Contractor by the Owner under the above procedure, then the oral directive shall be confirmed in writing by the Contractor within seven (7) calendar days. The cost or credit and time adjustments will be determined through negotiation as soon as practicable thereafter and will be incorporated in a Change Order to the Contract. Prior to such negotiations, the Contractor shall keep separate costs on the "PDL-NTE" Work done up to that point.

6.7.5 Processing: The Owner will undertake to formally process Owner-Contractor agreed Change Orders with thirty (30) calendar days of agreement.

6.7.6 Construction Change Directive: If the Owner and the Contractor fail to agree on the terms of a Change Order, then the Owner shall issue through the Architect/Engineer a Construction Change Directive which is a written order directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum and/or Contract Time.

6.7.6.1 A Construction Change Directive may be issued before, during or after changed Work is accomplished, under the following conditions:

.1 The Contractor fails to submit a timely price and/or time extension proposal for the changed Work.

.2 Negotiation fails to achieve an agreed price and/or time extension, or there remains a disagreement concerning any part of the changed Work.

.3 Contractor fails or refuses to timely execute a Change Order by affixing the Contractor's signature thereto.

6.7.6.2 The terms of a Construction Change Directive including the change in Contract Sum and/or Contract Time shall be determined by the Owner with the assistance of the Architect/Engineer and shall, in the Owner's judgment, be fair and reasonable.

6.7.6.3 When a Construction Change Directive has been issued, it shall have the full force and effect of a Contract modification. It shall be included in schedules, Applications for Payment, reports and all official records of the Contract. The issuance of a Construction Change Directive will not prejudice any of the Contractor's rights to make claims or to appeal disputed matters under provisions of this Contract.

6.7.7 Notice to Proceed with Change Order Work: It is recognized that time is often of the essence in the execution of Change Order Work. Accordingly, the Owner may issue written notices to proceed with the Change Order Work while the formal Change Order is still being processed. The Contractor shall comply with these notices to proceed on the representation that formal confirming Change Orders will be issued.

ARTICLE 7

CONTRACT PAYMENTS

7.1 Schedule of Values: Upon execution of the Contract by the Owner and the Contractor, the Contractor shall submit for approval to the Owner and the Architect/Engineer a breakdown of the Contract Sum, itemizing material and labor for the various classifications of the Work. This Schedule of Values will be used as the basis for the Contractor's Applications for Payment.

7.1.1 No Application for Payment will be considered prior to receipt and approval of the Schedule of Values, which shall be in such detail as may be required by the Owner. The Schedule of Values shall be submitted to the Architect and Owner not less than twenty (20) days prior to the first Application for Payment, and this shall be a condition precedent to the processing of the first payment. The Schedule of Values shall follow the trade divisions of the Project Manual. Each item shall be assigned labor or material values, or both, with the subtotal thereof equaling the value of the Work in place when completed. Contractor's overhead and profit, mobilization, bond, and insurance shall each be listed as a separate line item on the Schedule of Values. The sum of all line items shall equal the Contract Sum.

7.1.2 The Contractor shall submit with the Schedule of Values a copy of all worksheets used in preparation of its proposal, supported by a notarized statement that the worksheets are true and complete copies of the documents used to prepare the proposal. The Contractor's proposal sheets shall be handled as confidential documents to the extent permitted by law.

7.2 Progress Payments: Payment will be made to the Contractor upon receipt of monthly Applications for Payment as provided hereinafter for the Work performed, and materials suitably stored and protected on the construction site. Progress payments do not constitute acceptance of Work not in accordance with the Contract Documents. Contractor shall provide a Department of the Treasury I.R.S. Form W-9 (latest edition) to the Owner prior to the first Application for Payment.

7.2.1 Once each calendar month, the Owner shall make a progress payment to the Contractor based upon an Application for Payment certified by the Architect/Engineer (for Work performed under this Contract during the preceding calendar month) which shall be accompanied by an affidavit that all payrolls, bills for labor, materials, equipment, or other indebtedness connected with such Work have been paid or will be paid within thirty (30) days after the Owner's receipt of the Application for Payment, or within the period of time required by Government Code, Chapter 2251, Subchapter B (see below), and a Certified Payroll (if specifically requested by Owner).

2251.021 Time for Payment by Governmental Entity.

a) Except as provided by Subsection b), a payment by a governmental entity under a Contract executed on or after September 1, 1987, is overdue on the 31st day after the later of:

1) the date the govern-mental entity receives the goods under the Contract;
2) the date the performance of the service under the Contract is completed; or
3) the date the govern-mental entity receives an invoice for the goods or services.

b) A payment under a Contract executed on or after September 1, 1993, owed by a political subdivision whose governing body meets only once a month or less frequently is overdue on the 46th day after the later event described by Subsections a)1) through 3).

c) For a Contract executed on or after July 1, 1986, and before September 1, 1987, a payment by a governmental entity under that Contract is overdue on the 46th day after the later event described by Subsections a)1) through 3).

Added by Acts 1993, 73rd Leg., ch. 268, 1, eff. Sept. 1, 1993. Amended by Acts 1995, 74th Leg., ch. 76, 5.42(a), eff. Sept. 1, 1995.

2251.022 Time for Payment by Vendor

a) A vendor who receives a payment from a governmental entity shall pay a Subcontractor the appropriate share of the payment not later than the 10th day after the date the vendor receives the payment.

b) The appropriate share is overdue on the 11th day after the date the vendor receives the payment.

Added by Acts 1993, 73rd Leg., ch. 268, 1, eff. Sept. 1, 1993.

2251.023 Time for Payment by Subcontractor

a) A Subcontractor who receives a payment from a vendor shall pay a person who supplies goods or a service for which the payment is made the appropriate share of the payment not later than the 10th day after the date the Subcontractor receives the payment.

b) The appropriate share is overdue on the 11th day after the date the Subcontractor receives the payment.

Added by Acts 1993, 73rd Leg., ch 268, 1, eff. Sept. 1, 1993.

7.2.2 To insure the proper performance of this Contract, the Owner shall retain not less than five percent (5%) of the amount of each Application for Payment until final completion and acceptance of all Work covered by this Contract. If the Owner, at any time after fifty percent (50%) of the Work has been completed, finds that satisfactory progress is being made, then the Owner may make any of the remaining progress payments in full; and provided further that, upon completion and acceptance of each separate building, or other division of the Contract on which the price is stated separately in the Contract, payment may be made in full including retained percentages thereon less authorized deductions. After Substantial Completion of the Work the Owner shall, upon application by the Contractor, approved by the Architect/Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Article 3, such payment may be made under the terms and conditions governing final payment, and shall not constitute a waiver of claims. Final payment shall be made after completion of the Work by the Contractor in accordance with the Contract Documents.

7.2.2.1 The provisions of Government Code 2251.021 through 2251.023 apply to payments under this Contract.

7.2.2.2 Any request for reduction or release of retainage

shall be accompanied by written consent of the Contractor's Surety to the request.

7.2.3 In preparing Applications for Payment all materials delivered and labor performed shall be included in the progress upon which payment is based. However, payment for materials will not be made prior to approval of materials for which submission of a Technical Submittal is required. Furthermore, payment for stored materials will be on the basis of provided invoices.

7.2.4 The Owner may withhold or, on account of subsequently discovered evidence, nullify that part of any Application for Payment to such extent as may be necessary to protect the Owner from loss on account of:

.1 Defective Work not remedied.
.2 Damage to Work of another Contractor.
.3 Failure to maintain scheduled progress.
.4 Receipt of written notice by the Owner of unpaid bills, as stipulated in Sec. 53.232, Texas Property Code, if the Contractor has not provided a payment bond and if the Contract Sum does not exceed $25,000.00. Any funds so withheld shall be released to the Contractor if the Contractor furnishes a bond for release of lien as provided in Sec. 53.236, Texas Property Code. When the above grounds are removed, payment will be made for amounts withheld because of them.
.5 Persistent failure to carry out the Work in accordance with the Contract Documents.
.6 Reasonable evidence that the Work will not be completed within the Contract Time.
.7 Reasonable evidence that the Work cannot be completed for the remainder of the Contract Sum.
.8 Assessment of fines for violations of Prevailing Wage Rate laws.

7.2.5 All material and Work covered by progress payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and Work upon which payments have been made or the restoration of any damaged Work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.

7.2.6 Payments to the Contractor shall not be construed to release the Contractor or the Contractor's Surety from any obligations under this Contract.

7.2.7 Upon the Owner's request, manifest proof of the status of Subcontractor accounts shall be furnished in a form acceptable to the Owner.

7.2.8 Applications for Payment must be signed by a corporate officer or a representative specifically named by the Contractor.

7.2.9 If the Owner so requires, then the Contractor in requesting payment for materials, shall provide copies of bills of lading, invoices, delivery receipts or other evidence of the location and value of such materials.

7.3 Claims for Unpaid Labor and Materials:

7.3.1 When the value of the Contract between the Owner and the Contractor is not in excess of $25,000.00, claimants are referred to Texas Property Code, Section 53.231, for requirements that are prerequisite to the filing of a valid lien on funds unpaid to the Contractor at the time of filing of the claim.

7.3.2 When the Contract between the Owner and the Contractor is in excess of $25,000.00, claims must be sent directly to the Contractor and the Contractor's Surety in accordance with Chapter 2253, Texas Government Code. The Owner will furnish, in accordance with such Article, a copy of the Payment Bond to claimants upon their request.

7.3.3 All claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or the Contractor's Surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such responsibility because of any representation by any agent or employee.

ARTICLE 8

CONTRACT COMPLETION TIME

8.1 Notice to Proceed: The Contract Time will begin on the date designated in the Notice to Proceed issued by the Owner after receipt of the fully executed Owner-Contractor Agreement, the Performance Bond, Payment Bond, and required insurance documentation. The Contractor is required to complete the Work in the time that is stated in the Supplementary Conditions of the Contract for Construction or any extension thereof. The Owner may delay the Work, or any part thereof, for any reason, in which case the time for completion of the Work will be extended by an equivalent amount of time.

8.2 Construction Schedule:

8.2.1 The Contractor is responsible for developing its own schedule logic with appropriate durations and manpower; however, all information must be acceptable and compatible with the Owner’s needs, and all target,

completion and milestone dates generated must be acceptable to the Owner. Within 14 days after the Notice to Proceed, the Contractor shall prepare and submit for approval by the Owner a detailed network construction schedule using precedence format with activity numbers based on a reasonable, rational system for identification purposes. Durations shall be in working days and appropriate to the activity. The Owner reserves the right to reject any schedule or report that fails to reflect timely completion of the Project, or any intermediate milestone, or otherwise indicates unrealistic performance. Failure of the Contractor to delivery satisfactory schedules or reports to Owner will result in temporary suspension of progress payments.

8.2.2 The detailed construction schedule submitted by the Contractor shall reflect complete sequence of construction by activity including:

.1 Submittal and shop drawing activities for procurement packages and equipment,
.2 Product procurement and delivery dates including long lead items,
.3 Contractual milestone dates,
.4 Dates for beginning and completion of each element of construction,
.5 Disruptions and shutdowns due to other operations, facilities and functions,
.6 Anticipated periods of overtime or shift work,
.7 Dates for installation and testing of all equipment,
.8 Cleanup,
.9 Contract startup and closeout.

8.2.3 On a weekly basis, the current detailed construction schedule shall be provided by the Contractor, who shall give a brief report describing activities begun or finished during the preceding week and a projection of all activities to be started or finished in the week to follow.

8.2.4 Each month the Contractor shall provide a revised detailed construction schedule consisting of bar chart summaries and (if requested by the Owner) revised network diagrams and tabular lists of activities plus certified data which:

.1 shows all changes occurring since the previous submission of the updated schedule,
.2 indicates progress of each activity and shows completion dates,
.3 includes:
  .1 major changes in scope and logic changes
  .2 activities modified since previous updating
  .3 identification of any slippage
  .4 revised projections due to changes
  .5 out-of-sequence progress
  .6 other identifiable changes

In the event that a revised detailed construction schedule is not acceptable to the Owner, then said schedule shall be revised by the Contractor until it is found acceptable by the Owner.

8.3 Delays and Extension of Time:

8.3.1 The Contractor may be granted a time extension by the Owner because of changes ordered in the Contract or because of strikes, lockouts, fire, unusual delay in transportation, unavoidable casualties, inclement weather in excess of normal, or any cause beyond the Contractor's control, which affected critical path activities. The Owner may extend the Contract Time subject to the following provisions.

8.3.2 Claims for time extensions must be made in writing within thirty (30) calendar days after the occurrence of the delay. All time extension claims shall be supported by comparing the original Construction Schedule with an updated Schedule indicating delays to critical path activities**.** In the case of a continuing cause of delay, only one claim is necessary. Claims for time extensions shall be stated in numbers of whole or half work days. In case of claims for time extension because of inclement weather in excess of normal, such time extension shall be granted only because such inclement weather prevented the execution of critical path activities of Work which delayed the final completion of the Contract. Resolution of delay claims shall be made at the Date of Substantial Completion.

8.3.2.1 The Owner's representative shall ascertain the facts and the extent of the delay and extend the Contract Time when (in the representative's judgment) the findings justify such an extension of Contract Time. The findings of the Owner's representative are final and conclusive on both parties and subject only to appeal as provided in Subparagraph 5.2.1.

8.3.2.2 The Contractor shall notify the Owner of delays to critical path items as they occur; and these delays shall be identified during the weekly progress meetings.

8.3.2.3 Time extensions granted for causes described herein will be granted on the basis of one Regular Work Day extension for each Regular Work Day lost (i.e., seven (7) calendar days extension will be granted after five (5) Regular Work Days are lost except as modified by the provisions contained herein related to Anticipated Inclement Weather days).

8.3.2.4 Each Proposer shall include Anticipated Inclement Weather Days in his proposed Contract Time as noted in the following schedule:

Number of Anticipated Inclement Weather Days to be Included in Proposed Contract Time (These are regular

work days)

January	-3	July	-4
February	-4	August	-4
March	-4	September	-4
April	-2	October	-3
May	-5	November	-5
June	-6	December	-4

8.3.2.5 Inclement Weather Days shall pertain to such items as rain, flooding, snow, unusually high winds, which prevent progress on major portions of the Work on regular work days only. If such situations occur on more than the Number of Anticipated Inclement Weather Days included in the Proposed Contract Time and if those additional days prevent the Contractor from performing critical portions of the scheduled Work, then time extensions caused by inclement weather may be requested as enumerated hereinafter. If the inclement weather is rain related, then the rain at the site must have been in excess of 0.50 inch in 24 hours.

8.3.2.6 At the beginning of each month the Contractor shall submit a schedule showing 1) the scheduled number of Anticipated Inclement Weather Days for the particular month, 2) the Actual Inclement Weather Days requested, and 3) the Net Inclement Weather Days (plus, minus, or no change). At times deemed appropriate by the Architect, the Contract Time will be adjusted by Change Order if the total of Net Inclement Weather Days is substantially greater than 0. If at the end of the Project all Anticipated Inclement Weather Days have not been used, then the Contract Time will not be reduced. An example of the monthly schedule to be submitted is as follows:

Month	Anticipated Inclement Weather Days(Regular)	Actual Inclement Weather Days (Regular) Requested	Net Inclement Weather Days(Regular)
January	3	8	5
February	4	0	-4
March	4	2	-2
April	2	2	0
May	5	7	2
June	6	10	4
TOTAL	24	29	5

Using this example, there were five (5) Net Inclement Weather Days (regular) for the first six (6) months of the Project and the extension of Contract Time would be seven (7) calendar days (since a seven (7) calendar days extension is granted after five (5) Regular Work Days are lost).

8.3.3 The Contractor shall have no claim for compensation or damages due to delays in, or hindrances to, the Work and further agrees that the Contractor shall be fully compensated for all delays solely by a time extension.

8.3.4 No time extension shall release the Contractor or the Surety furnishing a performance or payment bond from all obligations thereunder; which obligations shall remain in full force until the discharge of the Contract.

8.3.5 No time extensions will be allowed for any of the following conditions:

8.3.5.1 At least seven (7) hours of available work time out of the work day.

8.3.5.2 Saturdays, Sundays or Holidays unless the Contract requires and stipulates overtime work.

8.3.5.3 Time required for drying of materials when it is possible for the Contractor to enclose the area and use drying devices.

8.3.6 The Contractor shall maintain a Project log indicating all time in excess of one (1) hour for which work was suspended during a work day in order to obtain any time extension.

8.3.7 The Contractor shall obtain approval from the Owner for work during the following times:

8.3.7.1 Saturdays, Sundays or Holidays.

8.3.7.2 Prior to 7:00 am and after 7:00 pm on scheduled work days.

8.4 Completion of Work: The Contractor will be held to account for the Work being completed in the Contract Time, or any extension thereof.

8.4.1 If, in the judgment of the Owner, the Work is behind schedule and the rate of placement of Work is inadequate to regain scheduled progress so as to insure timely completion of the entire Work or a separable portion thereof, then the Contractor, when so informed by the Owner, shall immediately take action to increase the rate of Work placement. This increase shall be accomplished by any one or a combination of the following or other suitable measures:

.1 An increase in Work forces.
.2 An increase in equipment or tools.
.3 An increase in hours of work or number of shifts.
.4 Expediting delivery of materials.

8.4.2 The Contractor shall, within ten (10) calendar days after being so informed, notify the Owner of the specific measures taken and/or planned to increase the

rate of progress together with an estimate as to when scheduled progress will be regained. Should the plan of action be deemed inadequate by the Owner, the Contractor shall take additional steps or make adjustments as necessary to the plan of action until it meets with the Owner's approval. The increased rate of work will continue until scheduled progress is regained. Scheduled progress will be established from the latest revised and accepted progress schedule for the Project. Timely completion will be understood to be the Contract completion date as revised by all time extensions granted at the time acceleration is undertaken. The Contractor shall not be entitled to additional compensation for the additional effort applied to the Work under the terms of this Subparagraph.

8.5 Failure to Complete Work on Time: The time set forth in the Supplementary Conditions of the Contract for Construction for the completion of all Work is an essential element of the Contract. Contractor's failure to complete the Work within such time will cause damage to the Owner. The value of such damages shall be stated in the Supplementary Conditions of the Contract for Construction.

8.5.1 The time specified for completion in the Supplementary Conditions of the Contract for Construction shall cover final cleanup of the premises and completion of punch list deficiencies.

8.5.2 For each consecutive calendar day after the expiration of the Contract Time that any Work (including the correction of deficiencies found during the Final Inspection) is not completed and accepted, the amount per day as stipulated in the Supplementary Conditions of the Contract for Construction will be deducted from the money due or to become due the Contractor, not as a penalty but as liquidated damages and added expense for Contract supervision and Owner's delay costs in obtaining the use of the Work.

ARTICLE 9

CONTRACT SUBSTANTIAL COMPLETION

9.1 Certification: Should the Owner wish to use or occupy the Project, or part thereof, prior to final completion, and the Project, or a designated portion thereof acceptable to the Owner, is substantially complete, the Contractor shall prepare for and submit to the Architect/Engineer a comprehensive list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Owner and Architect/Engineer on the basis of a Pre-Final Inspection determine that the Project or designated portion thereof is substantially complete, the Architect/Engineer will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion; shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, operation of permanent equipment, damage to the Work, and insurance; and shall fix the time within which the Contractor shall complete all items on the list accompanying the Certificate.

9.1.1 Prior to the Pre-Final Inspection, and as a prerequisite to issuance of a Certificate of Substantial Completion, the Contractor shall furnish to the Owner all Record Documents, instructional manuals, maintenance manuals, parts catalogs, wiring diagrams, operational manuals, maintenance material stocks, spare parts and tools, specified written warranties, guarantees and like publications or parts for all installed equipment, systems and like items required by the Contract Documents; and shall conduct all instruction of the Owner's personnel required by the Contract Documents. If the Contractor does not furnish these requirements and the Owner must, out of necessity, obtain these materials, instructions, information and data, then the cost for this procurement will be deducted from the monies due the Contractor.

9.1.2 If the Owner must take occupancy of the Project due to compliance with State laws and the Project is not substantially complete, then the Contractor shall purchase extended warranties on equipment which must be in operation for the Owner to take occupancy.

9.2 Date of Substantial Completion: The Date of Substantial Completion of the Project, or designated portion thereof, is the date jointly certified by the Architect/Engineer, Owner and Contractor when construction is Substantially Complete as herein before defined.

9.3 Additional Inspection Costs: The Contractor shall be charged by the Owner for any costs of re-inspection resulting from substantial differences between the Contractor's list of items to be completed or corrected and the list of items resulting from the Pre-Final Inspection.

ARTICLE 10

CONTRACT FINAL ACCEPTANCE AND PAYMENT

10.1 Notification: When the Project is completed, the Contractor shall notify the Owner in writing that the Project will be ready for Final Inspection on a definite date. Upon verification by the Contractor that the Project

is ready for Final Inspection and acceptance, the Architect/Engineer and the Owner will within ten (10) calendar days make a Final Inspection and, when the Project is found acceptable under the Contract Documents and the Contract is fully performed, make final payment to the Contractor.

10.2 Final Payment Documentation: Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect/Engineer for transmittal to the Owner:

.1 Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706
.2 Contractor's Affidavit of Release of Liens, AIA Document G706A
.3 Contractor's, Subcontractor's, Sub-subcontractor's, and Supplier's separate releases on the prescribed forms.
.4 Consent of Surety to Final Payment, AIA Document G707 (if applicable).
.5 Final list of Subcontractors and Sub-subcontractors, AIA Document G805.
.6 The Contractor and each and every Subcontractor, Sub-subcontractor and Supplier shall provide a"Certificate of No Asbestos, PCB and Lead". *The form used shall be the attached form on Page 28 of these General Conditions.* For the purpose of definition as used in this form, the term "potable water systems" includes, but is not limited to, those water systems for drinking fountains, all sinks and lavatories, showers, bath tubs, residential and commercial kitchen equipment, icemakers, and hose bibbs, as applicable to this specific Project.
.7 Material Safety Data Sheets: Effective September 1, 2000, the Texas Department of Health implemented a new rule in the AHERA Regulation which requires that Material Safety Data Sheets be provided to the Owner by the Contractor on the materials incorporated into the Work which but not limited to the list below (not all of which may have been used in this specific Project):
  .1 Floor Tiles
  .2 Sheet Floorings
  .3 Adhesives (Mastics)
  .4 Suspended Ceiling Tiles
  .5 Glued-on/Nailed-on Ceiling Tiles
  .6 Gypsum Board
  .7 Blown-in Insulation
  .8 Batt/Roll Insulation
  .9 Gaskets
  .10 Sprayed-on/Troweled-on Surfacing Materials
  .11 Pipe Insulation
  .12 Pipe Fitting Insulation
  .13 Boiler Insulation
  .14 Flue Insulation (Vent Pipe Insulation)
  .15 Heating/AC Ducting
  .16 Air Handler Cloth Joint (Flex Joint)
  .17 Air Handler Insulation

If Material Safety Data Sheets are not provided by the Contractor, then the Contractor shall be responsible for obtaining samples of the materials listed above and the required testing of the samples at no additional cost to the Owner. These Material Safety Data Sheets shall be included in the maintenance and instruction manuals.

10.3 Final Payment:

10.3.1 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

.1 Faulty or defective Work appearing after Substantial Completion;
.2 Failure of the Work to comply with the requirements of the Contract Documents; or
.3 Terms of any special warranties required by the Contract Documents.

10.3.2 Acceptance of final payment shall constitute a waiver of all claims by the Contractor except those specifically enumerated at the time of final payment.

ARTICLE 11

CONTRACT CORRECTION PERIOD

11.1 One Year Contract Correction Period: Except as otherwise specified, the Contractor warrants and guarantees all Work against defects in materials, equipment or workmanship. For one (1) year from the date of Substantial Completion of the entire Project or designated portions thereof, the Contractor shall undertake correction, repair or replacement of any defective of non-conforming work.

11.2 Remedy of Defects Under Warranty: Upon receipt of written notice from the Owner of the discovery of any defects, the Contractor shall remedy the defects and replace any property damaged therefrom occurring within the contract correction period. If the Contractor, after notice, fails to proceed and remedy such defects within five (5) days or within any other period of time which has been agreed in writing, or to comply with the terms of the warranty and guarantee, then the Owner may have the defects corrected and the Contractor and the Contractor's Surety shall be liable for all expenses incurred. If the defect needs immediate correction, e.g., A/C system fails causing possible dismissal of school, then the Owner will contact the Contractor, Subcontractor, Sub-subcontractor, or manufacturer (whichever applies), advise them of the defect and make repairs. An itemized list of labor and materials with

certified payrolls and material invoices will be forwarded to the Contractor for payment.

ARTICLE 12

OPERATION AND STORAGE AREAS

12.1 Contractor's Use of Premises: The Contractor will operate and maintain operations areas and associated storage areas at the Project site in accordance with the following:

12.1.1 All Contractor operations, including storage of materials and employee parking upon the Project site, shall be confined to areas designated by the Owner.

12.1.2 The Contractor may erect temporary buildings at its expense, which shall remain its property. The Contractor shall remove such buildings and associated utilities service lines upon completion of the Project, unless the Contractor requests and the Owner provides written consent that it may abandon such buildings and utilities in place.

12.1.3 The Contractor will use only established roadways, or construct and use such temporary roadways as may be authorized by the Owner. Load limits of vehicles shall not exceed the limits prescribed by appropriate regulations or law. The Contractor will provide protection to existing and new road surfaces, curbs, sidewalks, trees, shrubbery, sprinkler systems, drainage structures and other like existing and new improvements to prevent damage. Any damage thereto shall be repaired by, and at the expense of, the Contractor.

12.1.4 The Owner may restrict the Contractor's entry to the Project site to specifically assigned entrances and routes.

12.2 Contractor's Maintenance of Premises: The Contractor shall at all times keep the Project site free from the accumulation of waste, waste materials, rubbish, or construction debris during performance of Work.

12.2.1 During the period of construction, and not less frequently than once a week, the Contractor shall remove from the Project site any and all waste materials, rubbish, construction debris and trash; and shall dispose of such waste materials, rubbish, construction debris and trash off the property of the Owner. The Contractor shall mow and trim the grass within the Project site at least every other week throughout the entire Contract Time.

Prior to the Contractor's requested date for a Pre-Final Inspection, the Contractor shall remove any and all remaining equipment from the Project site and shall leave the premises in a clean, neat and workmanlike condition satisfactory to the Owner.

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.

CC - SPECIAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The following are special conditions of the Galena Park Independent School District Contract for Construction.

SCHOOL SCHEDULE

The Owner currently plans the following school operations on or near the site of the Work during the Contract Time:

1. Full school operations will be conducted at the school during the normal school year. During the summer vacation, limited school operations will be conducted.
2. The Contractor shall not perform any work during the week of the STAAR and/or EOC testing. Refer to the attached schedule.
3. When school is in session, if the Contractor is going to work during time periods listed below, then the Contractor will include in its Base Proposal the cost of a GPISD employee at the rate of $50.00 per hour to operate the security system and provide access to the facility.
    a. Prior to 7:00 AM, after 11:00 PM.
    b. Weekends - refer to attached schedule.
    c. Holidays - refer to attached schedule
4. The Contractor shall recognize the critical need for safety of all persons involved in the school program, and the need to conduct construction operations in such a way as to minimize disruption of school program operation. Contractor understands that it is the obligation of the Contractor to protect the Work, materials and equipment from vandalism and theft, and that it cannot rely on school security personnel to perform this function.
5. Critical areas and systems including, but not limited to, air conditioning system, electrical system and kitchen must remain functional at all times while the school is in operation. Any renovation work that would require a shut down of these items must be accomplished during vacations, holidays, or at other times when the school is not operating.

CRIMINAL HISTORY

If Contractor does not have access to the criminal history records of employees who will work at the Sites, Contractor shall ensure such employees cooperate and submit all information necessary for District's LEE Fast Pass procedure.

CONSTRUCTION SCHEDULE

The new Galena Park ISD Multi-Use Facility and weight room portion of the project must be substantially completed by February 14, 2027, and completed prior to the commencement of the renovation work that is to be done to the existing Fieldhouse.

2025 | 26 SCHOOL CALENDAR

July 2025

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

August 2025

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

September 2025

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

October 2025

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November 2025

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

December 2025

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

January 2026

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February 2026

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

March 2026

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April 2026

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May 2026

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June 2026

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Important Dates

August 12 — First Day of School
May 22 — Last Day of School

New Teacher Orientation

July 29 - August 1

Student Holiday/Staff Development

August 4 - 11, 29
October 14
January 5
March 6
September 19
November 3, 4
February 13
April 2

Early Dismissal All Campuses

December 19
May 22

Holidays

July 4
October 10 - 13
Dec. 22 - Jan. 2
February 16
April 3 - 6
June 19
September 1
November 24 - 28
January 19
March 9 - 13
May 25

LEGEND

- Student Holiday/Staff Development
- District Holidays
- School Holidays, except for EOC Testing
- New Teacher Orientation
- Early Dismissal - All Campuses

SCHOOL HOURS

Elementary School	7:35 am - 3:15 pm
Middle School	8:20 am - 4:00 pm
High School	7:05 am - 2:45 pm
Early College High School	8:00 am - 4:15 pm
Zotz Education Center	8:15 am - 3:55 pm

Six Weeks Grading Period

High Schools

First Semester		Report Card Dates
1. Aug. 12 - Sept. 18	(26 days)	Sept. 26
2. Sept. 22 - Oct. 31	(27 days)	Nov. 7
3. Nov. 5 - Dec. 19	(28 days)	Jan. 9
Second Semester		
4. Jan. 6 - Feb. 12	(27 days)	Feb. 20
5. Feb. 17 - Apr. 1	(26 days)	Apr. 10
6. Apr. 7 - May 22	(34 days)	June 4

Nine Weeks Grading Period

Elementary/Middle Schools

First Semester		Report Card Dates
1. Aug. 12 - Oct. 9	(39 days)	Oct. 17
2. Oct. 15 - Dec. 19	(42 days)	Jan. 9
Second Semester		
3. Jan. 6 - Mar. 5	(40 days)	Mar. 20
4. Mar. 16 - May 22	(47 days)	May 26 ES/May 29 MS

State Testing Days

December 2 - 12	End of Course Testing
April 7 - April 24	STAAR/End of Course
May 4 - May 15	Dual Credit Finals/AP Testing
June 17 - 20	STAAR/End of Course Retest

(Subject to change if needed)

Galena Park Independent School District

14705 Woodforest Blvd. * Houston, Texas 77015 * 832-386-1000 * www.galenaparkisd.com

01/27/2025

PROJECT MANUAL

OCTOBER 1, 2025

North Shore Multi-use Indoor Facility

GALENA PARK ISD

HOUSTON, TEXAS

VLK Project No.

25-0056.00

OWNER:

Galena Park Independent School District

14705 Woodforest Blvd.

Houston, TX 77015

OWNER

Galena Park
Independent School District
14705 Woodforest Blvd
Houston, Texas 77015

ARCHITECT

VLK
Tam Quang
20445 State Hwy 249, Suite 350
Houston, Texas 77070
Phone: 281.671.2300
www.vlkarchitects.com



10/01/2025

STRUCTURAL ENGINEER

Matrix Structural
Firm Registration Number: F-2640
Khalil Tabaja, P.E.
5177 Richmond Avenue, Suite 670
Houston, Texas 77056
Phone: 713.333.0104
www.matrixstructural.com

Matrix Structural Engineers
TBPE Firm Registration No. F-2640



10/01/2025

CIVIL ENGINEER

Adico Consulting Engineers
Firm Registration Number F-16423
Phasith Nanthavong, P.E.
205 E. Edgewood Dr.
Friendswood, Texas 77546
Phone: 345.385.1016
www.adico-llc.com



10-01-2025

PROJECT MANUAL

OCTOBER 1, 2025

North Shore Multi-Use Indoor Facility

GALENA PARK ISD

HOUSTON, TEXAS

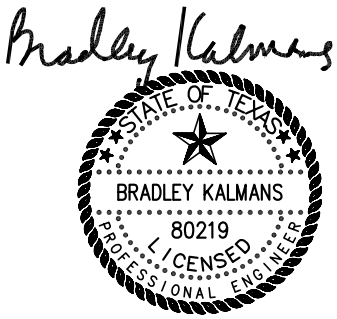
VLK Project No.

25-0056.00

Copyright © 2025, VLK Architects

MEP ENGINEER

Salas O'Brien
Firm Registration Number: F-4111
Brad Kalmans, P.E.
10930 W. Sam Houston Parkway
North, Suite 900
Houston, Texas 77064
Phone: 281.664.1900
www.salasobrien.com/offices/houson-texas



10/01/2025

PROJECT MANUAL

OCTOBER 1, 2025

North Shore Multi-Use Indoor Facility

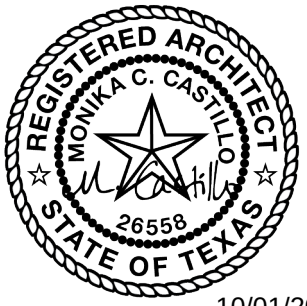
GALENA PARK ISD

HOUSTON, TEXAS

VLK Project No.

25-0056.00

Copyright © 2025, VLK Architects



10/01/2025

DOCUMENT 00 01 10

TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

PROCUREMENT REQUIREMENTS AND CONTRACTING REQUIREMENTS

Document OWNER'S COMPETITIVE SEALED PROPOSAL DOCUMENTS - CSP # 25-603, Project # 1001

- Proposal Checklist
- Table of Contents
- Base Proposal Information
- Ship to Information
- Proposal Attributes
    - Introduction
    - Submission Response
    - Communications Statement
    - Attachments Required
    - Proposal Opening
    - Submission Required PRIOR to Proposal Opening
    - Instructions to Proposers for Contracts for Construction
    - Project Information
    - Proposal Acknowledgement
    - Proposal Bond for Building Construction Contracts
    - Proposal Phase Procedures
    - Felony Conviction Notice
    - Affidavit of Non-Collusion
    - Certificate of Residency
    - Verification of Business Type
    - Conflict of Interest Questionnaire
    - Contractor's Proposed Project Personnel
    - Antitrust Certification Statement
    - Form 1295 – Certificate of Interested Parties
    - Contract Documents Deviations and Exceptions
- Base Proposal
- Alternates Proposal
- Unit Prices
- Subcontractor Listing
- Small Business Enterprise Program (SBEP)
- Contractor Information
- Base Bid Attachments
    - Request for Taxpayer Identification Number and Certification
    - Conflict of Interest Questionnaire
    - Certificate of Interested Parties Form 1295
    - State and Federal Certification Form
    - Certification of Criminal History Record Information
- Sample Construction Documents
    - Standard form of Agreement between Owner and Contractor for Building Construction Contracts
    - Instructions for Performance and Payment Bonds
- General Conditions of the Contract for Construction
- Supplementary Conditions to the General Conditions of the Contract for Construction
- CC - Special Conditions of the Contract for Construction

Document 00 31 32 - Geotechnical Data
00 65 00 - Release of Lein
00 73 50 - Weather Table



10/01/2025

DIVISION 01 - GENERAL REQUIREMENTS

Section 01 11 00 - Summary of Work
01 21 00 - Allowances
01 23 00 - Alternates
01 29 00 - Payment Procedures
01 31 00 - Project Management and Coordination
01 31 19 - Project Meetings
01 31 19.13 - Preconstruction Meetings
01 32 16 - Construction Progress Schedules
01 33 23 - Shop Drawings, Product Data, and Samples
01 35 00 - Alteration Project Procedures
01 41 00 - Regulatory Requirements
01 42 00 - References
01 42 16 - Definitions
01 45 00 - Quality Control
01 45 23 - Testing and Inspection Services
01 50 00 - Temporary Facilities and Controls
01 62 00 - Product Options
01 65 00 - Product Delivery Requirements
01 66 00 - Product Storage and Handling Requirements
01 73 29 - Cutting and Patching
01 74 13 - Cleaning
01 77 00 - Closeout Procedures
01 78 23 - Operation and Maintenance Data
01 78 30 - Warranties and Bonds
01 78 39 - Project Record Documents
01 78 40 - Spare Parts, Overages and Maintenance Materials

DIVISION 02 - EXISTING CONDITIONS

Section 02 41 19 - Selective Structure Demolition

DIVISION 03 - CONCRETE

Section 03 11 00 - Concrete Forming and Accessories
03 20 00 - Concrete Reinforcing
03 30 00 - Cast-in-place Concrete
03 35 46 - Concrete Topical Treatments
03 54 13 - Self-leveling Underlayment

DIVISION 04 - MASONRY

Section 04 20 00 - Masonry Units
04 72 00 - Cast Stone Masonry

DIVISION 05 - METALS

Section 05 12 00 - Structural Steel Framing
05 21 00 - Steel Joists Framing
05 31 00 - Steel Decking
05 40 00 - Cold-formed Metal Framing
05 50 00 - Metal Fabrications

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

Section 06 10 00 - Rough Carpentry
06 16 56 - Air- and Water-Resistive Sheathing Board System



10/01/2025

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

Section 07 11 13 - Bituminous Dampproofing
07 13 26 - Self-adhering Sheet Waterproofing
07 14 00 - Fluid-applied Waterproofing
07 18 13 - Pedestrian Traffic Coating
07 19 00 - Water Repellents
07 21 00 - Building Insulation
07 26 00 - Vapor Retarders
07 27 26 - Fluid-Applied Membrane Air Barriers
07 41 20 - Prefinished Metal Roof Panels
07 42 13 - Metal Wall Panels
07 46 50 - Aluminum Faced Composite Panel System
07 48 00 - Rainscreen Attachment System
07 52 00 - Modified Bituminous Membrane Roofing
07 62 00 - Sheet Metal Flashing and Trim
07 65 00 - Flexible Flashing
07 72 13 - Manufactured Roof Curbs and Portals
07 72 33 - Roof Hatches
07 81 16 - Cementitious Fireproofing
07 81 23 - Intumescent Fireproofing
07 84 00 - Firestopping
07 92 00 - Joint Sealants
07 95 00 - Expansion Control

DIVISION 08 - OPENINGS

Section 08 11 00 - Hollow Metal Doors and Frames
08 14 23 - Plastic-Laminate-Faced Wood Doors
08 31 00 - Access Doors
08 33 13 - Coiling Counter Doors
08 33 23 - Overhead Coiling Doors
08 36 13 - Sectional Overhead Doors
08 41 13 - Aluminum-framed Entrances and Storefronts
08 45 23 - Insulated Translucent Sandwich Panel Wall
08 71 00 - Door Hardware
08 80 00 - Glazing

DIVISION 09 - FINISHES

Section 09 21 14 - Glass-Fiber-Reinforced Gypsum Assemblies
09 21 16 - Gypsum Board Assemblies
09 21 19 - Gypsum Board Shaft Wall Assemblies
09 30 00 - Tiling
09 51 00 - Acoustical Ceilings
09 54 23 - Linear Metal Ceilings
09 65 13 - Resilient Base
09 65 16 - Resilient Sheet Flooring
09 65 16.33 - Rubber Sheet Flooring
09 66 23.16 - Epoxy-resin Terrazzo Flooring
09 67 23 - Resinous Flooring
09 68 00 - Carpeting
09 72 16 - Vinyl-coated Fabric Wall Covering
09 72 21 - Sanitary Wall Panels
09 72 26 - Custom Digital Wallcovering
09 91 00 - Painting



10/01/2025

DIVISION 10 - SPECIALTIES

Section 10 11 16 - Markerboards and Tackboards
10 14 00 - Identifying Devices
10 21 13.17 - Solid Phenolic Toilet Compartments
10 22 13 - Wire Mesh Partitions
10 22 39 - Folding Panel Partitions
10 26 13 - Corner Guards
10 26 23.13 - Impact Resistant Wall Protection
10 28 00 - Toilet Accessories
10 44 13 - Fire Extinguishers and Cabinets
10 51 13 - Metal Lockers
10 56 13 - Metal Storage Shelving
10 56 28 - Athletic Mobile Storage Systems
10 73 26 - Prefabricated Walkway Covers
10 82 16 - Equipment Screens
10 99 00 - Miscellaneous Specialties

DIVISION 11 - EQUIPMENT

Section 11 31 00 - Appliances
11 66 00 - Athletic Equipment

DIVISION 12 - FURNISHINGS

Section 12 21 13 - Horizontal Blinds
12 32 00 - Manufactured Casework

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13 34 19 - Metal Building Systems
13 42 75 - Integrated Interior Assemblies

DIVISION 14 - CONVEYING EQUIPMENT

Section 14 65 00 - Jib Cranes

DIVISIONS 15 through 20 - Not used.

DIVISION 21 - FIRE SUPPRESSION

Section 21 01 00 - Fire Protection Operating and Maintenance Manuals
21 05 00 - Fire Protection General Provisions
21 05 10 - Fire Protection Contract Quality Control
21 05 12 - Fire Protection Shop Drawings, Coordination Drawings & Product Data
21 05 13 - Electrical Provisions of Fire Protection Work
21 10 00 - Fire Sprinkler Systems
21 31 13 - Fire Pump System
21 31 14 - Fire Pump Controller with Transfer Switch



10/01/2025

DIVISION 22 - PLUMBING

Section 22 01 00 - Plumbing Operating and Maintenance Manuals
22 05 00 - Plumbing General Provisions
22 05 10 - Plumbing Contract Quality Control
22 05 12 - Plumbing Shop Drawings, Coordination Drawings & Product Data
22 05 13 - Electrical Provisions of Plumbing Work
22 05 14 - Plumbing Alterations Project Procedures
22 05 15 - Plumbing Earthwork
22 05 16 - Excavating, Backfilling and Compacting for Utilities Outside Building Slab
22 05 17 - Plumbing Access Doors
22 05 19 - Pressure and Temperature Instruments
22 05 23 - Valves, Strainers, And Vents
22 07 19 - Plumbing Piping Insulation
22 11 16 - Domestic Water Piping and Appurtenances
22 11 19 - Piping and Piping Appurtenances for Cold Water Makeup
22 11 23 - Domestic Water Pumps
22 11 25 - Domestic Water Booster Pump
22 12 24 - Fiberglass Non-Pressure Water Storage Tanks
22 12 25 - Liquid Level Control Panel for Surge Tanks
22 13 16 - Soil, Waste and Sanitary Drain Piping, Vent Piping and Appurtenances
22 14 13 - Roof Drainage Piping and Appurtenances
22 20 00 - Plumbing Pipe and Pipe Fittings - General
22 33 33 - Electric Water Heater
22 34 32 - Gas-Fired Domestic Water Heater
22 40 00 - Plumbing Fixtures and Fixture Carriers
22 63 11 - Gas Piping and Appurtenances

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

Section 23 01 00 - HVAC Operating and Maintenance Manuals
23 05 00 - Mechanical General Provisions
23 05 10 - HVAC Contract Quality Control
23 05 11 - Mechanical Alterations Project Procedures
23 05 12 - HVAC Shop Drawings, Coordination Drawings & Product Data
23 05 13 - Electrical Provisions of HVAC Work
23 05 14 - HVAC Condensate Drain Piping System
23 05 17 - HVAC Access Doors
23 05 18 - Variable Frequency Inverter
23 05 19 - HVAC Pressure and Temperature Instruments
23 05 23 - HVAC Valves, Strainers and Vents
23 05 48 - Vibration Isolation
23 05 93 - Testing, Balancing and Adjusting (Tab) Of Environmental Systems
23 05 94 - Coordination of Testing and Balancing
23 07 13 - External Duct Insulation
23 07 16 - Vessel Insulation
23 07 19 - HVAC Piping Insulation
23 08 00 - Mechanical Commissioning Coordination
23 09 33 - Building Management and Control System
23 20 00 - HVAC Pipe and Pipe Fittings - General
23 21 13 - Hot Water and Chilled Water Piping, Valves and Appurtenances
23 21 23 - HVAC Pumps
23 21 27 - Painting
23 23 00 - Refrigerant Piping and Appurtenances
23 25 12 - Flushing and Cleaning of Steel Piping System
23 25 13 - Circulating Water System Chemical Treatment
23 31 13 - Ductwork
23 31 14 - Fabric Air Dispersion System
23 34 16 - Fans
23 34 18 - Industrial High Volume Low Speed Fans (Direct Drive)
23 37 13 - Air Devices
23 41 00 - Air Filtration
23 52 35 - Gas-Fired Modulating Hot Water Boiler (Condensing)
23 65 28 - Air-cooled Variable Speed Rotary Screw Chiller

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) (CONTINUED)

Section 23 73 13 - Air Handling Units
23 81 24 - Weatherproof Roof-Mounted Air Handling Unit
23 82 16 - Heating and Cooling Coils
23 82 18 - Ductless Mini Split Dx Units
23 82 19 - Fan Coil Units
23 82 39 - Electric Unit Heaters

DIVISIONS 24 and 25 - Not used.



10/01/2025

DIVISION 26 - ELECTRICAL

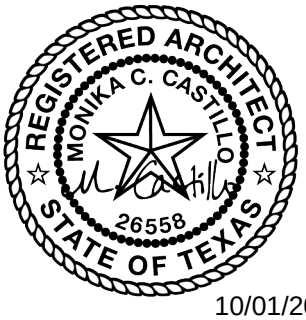
Section 26 01 00 - Commissioning of Electrical Systems
26 01 05 - Electrical Operating and Maintenance Manuals
26 05 00 - Electrical General Provisions
26 05 09 - Electric Utility Coordination and Service Entrance
26 05 10 - Contract Quality Control
26 05 12 - Electrical Shop Drawings Coordination Drawings, & Product Data
26 05 16 - Excavating, Backfilling and Compacting for Electrical
26 05 19 - Conductors and Connectors - 600 Volt
26 05 26 - Electrical Grounding
26 05 33 - Conduit Systems
26 05 35 - Electrical Connections for Equipment
26 05 37 - Electrical Boxes and Fittings
26 05 40 - Electrical Gutters and Wireways
26 05 50 - Firestops
26 05 53 - Identification for Electrical Systems
26 05 73 - Arc Flash Hazard Analysis / Short-Circuit / Coordination Study
26 09 25 - Electrical Contactors
26 09 28 - Digital Lighting Controls
26 12 13 - Pad-Mounted Transformers, Liquid Filled
26 12 15 - Dry-Type Transformers
26 24 13 - Switchboards
26 24 16 - Panelboards and Enclosures
26 24 25 - Enclosed Switches
26 24 30 - Fuses
26 27 73 - Line Voltage Wiring Devices
26 36 00 - New Automatic Transfer Switches
26 41 13 - Lighting Protection System
26 43 00 - Surge Protection Devices
26 51 13 - Lighting Fixtures
26 56 00 - Site Lighting
26 56 67 - Sports Field Lighting System
26 56 74 - Direct Burial Prestressed Concrete Lighting Poles

DIVISION 27 - COMMUNICATIONS

Section 27 01 00 - Operation and Maintenance (O&M) Manuals of Communications Systems
27 05 00 - Communications Basic Materials, Methods, and General Provisions
27 05 05 - Communications Alterations Project Procedures
27 05 07 - Communications Shop Drawings, Coordination Drawings & Product Data
27 05 09 - Contract Quality Control
27 05 10 - Firestops
27 10 00 - Structured Cabling Systems (SCS)
27 41 16.20 - Audio and Video Distribution Systems for Special Venues
27 50 00 - School Communication System

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

Section 28 01 00 - Operation and Maintenance (O&M) Manuals of Electronic Safety and Security Systems
28 05 00 - Electronic Safety and Security Basic Materials, Methods, and General Provisions
28 05 05 - Electronic Safety and Security Alterations Project Procedures
28 05 07 - Shop Drawings, Coordination Drawings & Product Data
28 05 10 - Contract Quality Control
28 05 50 - Firestops
28 10 00 - Access Control System (ACS)
28 16 01 - Intrusion Detection System
28 20 00 - Video Surveillance System (VSS)
28 46 02 - Expansion of Existing Fire Detection and Alarm System



10/01/2025

DIVISIONS 29 and 30 - Not used.

DIVISION 31 - EARTHWORK

Section 31 00 00 - Site Earthwork
31 06 20.15 - Cement Stabilized Sand
31 06 20.17 - Utility Backfill Materials
31 11 00 - Site Clearing and Grubbing
31 22 00 - Site Grading
31 23 13 - Building Subgrade Preparation
31 23 16.14 - Trench Safety System
31 23 33 - Trenching and Backfilling
31 31 16 - Termite Control
31 63 29 - Drilled Concrete Piers
- Pier Reconciliation Worksheets

DIVISION 32 - EXTERIOR IMPROVEMENTS

Section 32 05 19 - Geotextiles for Exterior Improvements
32 11 13.13 - Lime-Treated Subgrades
32 11 16 - Drainage Stone Base
32 13 13 - Concrete Paving
32 13 13.10 - Concrete Paving Curing
32 13 13.25 - Concrete Sidewalks
32 13 73 - Concrete Paving Joint Sealants
32 16 13 - Curbs and Gutters
32 17 23 - Pavement Markings
32 18 13 - Synthetic Grass Surfacing
32 18 14 - Paved Elastic Layer
32 31 15 - Vinyl-Clad Chain Link Fencing
32 31 19 - Decorative Metal Fences and Gates
32 33 05 - Architectural Site Furnishings
32 91 13.13 - Topsoil Placement and Grading

DIVISION 33 - UTILITIES

Section 33 05 13 - Manholes and Structures
33 05 16.13 - Precast Concrete Utility Structures
33 05 16.16 - Concrete for Utility Construction
33 06 10.14 - Polyvinyl Chloride (PVC) Pipe
36 06 10.15 - Ductile Iron Pipe and Fittings
33 06 40.10 - HDPE Solid and Profile Wall Pipe
33 06 40.11 - Reinforced Concrete Pipe
33 11 00 - Water Utility Distribution Piping
33 12 13.10 - Tapping Sleeves and Valves
33 12 13.12 - Wet Connections
33 12 16 - Water Utility Distribution Valves
32 12 19 - Water Utility Distribution Fire Hydrants
33 12 40 - Valve Boxes, Meter Boxes, and Meter Vaults
33 13 00 - Disinfecting of Water Utility Distribution
33 13 00.10 - Hydrostatic Testing of Pipelines

DIVISION 33 - UTILITIES (Continued)

Section 33 31 00 - Sanitary Utility Sewerage Piping
33 31 00.10 - Acceptance Testing for Sanitary Sewers
33 41 00 - Storm Utility Drainage Piping
33 49 13 - Storm Drainage Manholes, Frames and Covers



10/01/2025

DIVISION 34 - TRANSPORTATION through DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

NONE IN THIS PROJECT

DIVISIONS 36 through 39 - Not used.

DIVISION 40 - PROCESS INTERCONNECTIONS through DIVISION 46 - WATER AND WASTEWATER EQUIPMENT

NONE IN THIS PROJECT

DIVISION 47 - Not used.

DIVISION 48 - ELECTRICAL POWER GENERATION

NONE IN THIS PROJECT

DIVISION 49 - Not used.

Volume 01

GPISD Multi-Use Facility

GPISD Project #: 1001

CSP#: 25-603

GALENA PARK INDEPENDENT SCHOOL DISTRICT

GPISD
FACILITY PLANNING
AND CONSTRUCTION

Proposal Checklist

Project:	GPISD Multi-Use Facility
Project #:	1001
Total Project Budget:	$26,960,000
Pre-Proposal Conference:	Galena Park ISD Administration Building 14705 Woodforest Blvd, Houston, TX 77015 October 9, 2025 at 10:00 AM Attendance is highly recommended.
Proposal Opening Location:	Galena Park ISD Administration Building 14705 Woodforest Blvd, Houston, TX 77015
Proposal Deadline:	October 28, 2025, Base at 2:00 PM C/T Alternates at 3:00 PM C/T

Items Due 5 Business Days Prior to Proposal Opening – October 21, 2025

Pre-Proposal Information (See attribute 6 for additional information)

- ☐ OSHA (Occupational Safety & Health Administration) inspection logs for the last 3 years, a loss analysis from the Offeror's insurance carrier, & a loss history covering all lines of insurance coverage carried by the Offeror.
- ☐ Qualification Statement (AIA Document A305).
- ☐ A list of at least five (5) projects of similar scope as the project being proposed of which have been completed in the last five (5) years.
- ☐ Contractor's Proposed Project Personnel.

Items Due at Bid Time – October 28, 2025 Base at 2:00 PM C/T Alternates at 3:00 PM C/T

Bid Package including:

- ☐ Bid Bond/Proposal Bond (10%)
- ☐ Response to Sections 1 - 20
- ☐ Respond to All Bid Lines
- ☐ Respond to All Alternate Bid Lines
- ☐ Unit Prices
- ☐ Subcontractor Listing
- ☐ Small Business Enterprise Program (SBEP)
- ☐ Contractor Information

Bid Attachments

- ☐ Request for Taxpayer Identification Number and Certification W9
- ☐ Conflict of Interest Questionnaire
- ☐ Certificate of Interested Parties Form 1295
- ☐ State and Federal Certification Forms
- ☐ Certification of Criminal History Record Information

Contract Documents [provided for Proposal Preparation, does not need to be submitted with proposal]

Table of Contents

Base Proposal **27 Pages**

Base Proposal Information Page 1
Proposal Attributes Page 3

1. Introduction
2. Submission Response
3. Communications Statement
4. Attachments Required
5. Proposal Opening
6. Submission Required PRIOR to Proposal Opening
7. Instructions to Proposers for Contracts for Construction
8. Project Information
9. Proposal Acknowledgement
10. Proposal Bond for Building Construction Contracts
11. Proposal Phase Procedures
12. Felony Conviction Notice
13. Affidavit of Non-Collusion
14. Certificate of Residency
15. Verification of Business Type
16. Conflict of Interest Questionnaire
17. Contractor's Proposed Project Personnel
18. Antitrust Certification Statement
19. Form 1295 – Certificate of Interested Parties
20. Contract Documents Deviations and Exceptions

Proposal Lines **Page 25**
Alternate Proposal Lines **Page 5**
Unit Prices **Page 8**
Subcontractor Listing Page 20
Small Business Enterprise Program Page 26
Contractor Information Page 27

Base Bid Attachments **28 Pages**

Request for Taxpayer Identification Number and Certification
Conflict of Interest Questionnaire
Certificate of Interested Parties Form 1295
State and Federal Certification Form
Certification of Criminal History Record Information

Sample Construction Documents **31 Pages**

Standard form of Agreement between Owner and Contractor for Building Construction Contracts
Instructions for Performance and Payment Bonds
General Conditions of the Contract for Construction
Supplementary Conditions to the General Conditions of the Contract for Construction
Special Conditions of the Contract for Construction

Base Proposal Information

CSP #	25-603
Project:	Galena Park ISD Multi-Use Facility
Type:	Competitive Sealed Proposal
Issue Date:	October 5, 2025
Question Deadline:	October 21, 2025
Response Deadline:	October 28, 2025

25-603 **PROPOSAL** Close Date and Time: Tuesday, October 28, 2025

Galena Park Independent School District (GPISD) is requesting **Competitive Sealed Proposals (CSP** 25-603**)** for Galena Park ISD Multi-Use Facility **(GPISD Project** 1001**)**. **Proposals are due on October 28, 2025, Base at 2:00 PM C/T & Alternates at 3:00 PM C/T,** after which proposals will be opened publicly and read aloud at the GPISD Administration Building. Submissions must be delivered to the **Facilities Planning and Construction Department** in the GPISD Administration Building, 14705 Woodforest Blvd., Houston, TX 77015, in a sealed envelope by the close date and time stated in this Proposal event. A Proposal Security in the amount of ten percent (10%) of the proposal amount is required.

The scope of work includes Ground up Multi-Use Facility with Weight-Room, and Existing Fieldhouse Renovation.

A pre-proposal conference will be held at the **GPISD Administration Building**, on **Thursday, October 9, 2025,** Attendance is highly recommended.

Proposal Documents will be available on October 5, 2025 on the district website, and on the GPISD eBid system https://galenaparkisd.ionwave.net.

GPISD reserves the right to reject any and all proposals, the right to negotiate with any proposers after submission of proposals, and at its discretion, may waive any formalities or minor irregularities regarding the proposals.

Ship To Information

Address: Facilities Planning and Construction Department
Galena Park ISD Administration Building
14705 Woodforest Blvd.
Houston, TX 77015
Phone: (832) 386-1020
Email: capitalprojects@galenaparkisd.com

Billing Information

Address: Accounts Payable
Galena Park ISD Administration Building
14705 Woodforest Blvd.
Houston, TX 77015
Phone: (832) 386-1025
Fax: (832) 386-1428
Email: accounts_payable@galenaparkisd.com

Activities

Pre-Proposal Conference	October 9, 2025 at 10:00 AM
Pre-Proposal Information Due	October 21, 2025
Response to Questions Due	October 23, 2025
Board of Trustee Meeting	November 10, 2025
Contract Execution	November 11, 2025
Owner Receives Bonds and Insurance	November 17, 2025
Notice to Proceed	November 24, 2025
Substantial Completion	August 1, 2027
Final Completion	August 1, 2028

Proposal Attributes

1. Introduction

There are attributes, including this one, associated with this proposal. Some are notes and require no response, but most have a required response.

2. Submission Response

Please ensure that you respond to all Proposal Attributes and Line Items. Manual submissions must be delivered to the Facilities Planning and Construction Department, in a sealed envelope by the close date and time stated in this Proposal event. No fax or email submissions will be accepted. Manual submission shall consist of one (1) original hard copy and one (1) electronic flash drive. For any questions, please contact the Facilities Planning and Construction Department at capitalprojects@galenaparkisd.com.

3. Communications Statement

Contact between vendors and Galena Park ISD personnel during the proposal process or evaluation process is prohibited. Any attempt by vendors during the proposal process to contact district personnel may result in disqualification. All communication shall go through the Facilities Planning and Construction Department during this competitive process. All questions received and the corresponding answers will be distributed to all Proposers. No verbal responses will be provided. The deadline for questions about this proposal is stated in the Proposal Activities and the district will not respond to questions after this time and date. Response to questions will be posted in the ebid system and on Addenda. The vendors will be responsible for checking the ebid system for any posted responses.

4. Attachments Required

Be sure to submit all required documents and forms.

5. Proposal Opening

Any proposal received later than the specified time, whether delivered in person or by any other method shall be disqualified. Any questions pertaining to the proposal procedures should be addressed to the Facilities Planning and Construction Department at capitalprojects@galenaparkisd.com. If the District office location where proposals are to be submitted is closed due to inclement weather, natural disaster, or for any other cause including if the electronic Proposal system is unavailable on the due date, the deadline for submission shall be extended until the next District business day, unless the Proposer is otherwise notified by the District. The time of day for submission shall remain the same.

6. Submission Required PRIOR to Proposal Opening

The following forms are required **5 days prior to the proposal opening**:

- OSHA (Occupational Safety and Health Administration) inspection logs for the last three years, a loss analysis from the Proposer's insurance carrier, and a loss history covering all lines of insurance coverage carried by the Proposer.
- Qualification Statement (AIA Document A305).
- A list of at least five (5) projects of similar scope as the project being proposed of which have been completed in the last five (5) years.
- Contractor's Proposed Project Personnel.

Proposer Qualification Statements are the primary vehicle used by the project evaluation members to assess the credentials of the Proposer with respect to evaluation criteria set forth in the Project Manual leading to the recommendation for award of Contract.

In order to receive full consideration during the proposal evaluation period, each Proposer must submit a completed Qualification Statement (AIA Document A305) to the Architect and Owner.

Forms should be submitted to **BOTH** the Architect/Engineer at **tquong@vlkarchitects.com** and to the GPISD Facilities Department at **facilities@galenaparkisd.com**

7. Instructions to Proposers for Contracts for Construction

ARTICLE 1. DEFINITIONS

1.0 Definitions set forth in the GPISD General Conditions of the Contract for Construction, or in other Proposal Documents, are applicable to the Proposal Documents.

1.1 Proposal Documents: Advertisement for Competitive Sealed Proposals, Instructions to Proposers, Proposal Security, Proposal Form, Felony Conviction Notice, Affidavit of Non-collusion, Certificate of Residency, the Drawings and the Project Manual.

1.2 Sub-proposer: A person or entity who submits a proposal to a Proposer for materials, equipment or labor for a portion of the Work.

1.3 Addenda: Written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Proposal Documents by additions, deletions, clarifications or corrections.

1.4 Proposal: A complete and properly signed Proposal to do the Work for the sums stipulated therein, submitted in accordance with the Proposal Documents.

1.5 Base Proposal: The sum stated in the Proposal for which the Proposer offers to perform the Work described in the Proposal Documents as the Base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Proposals.

1.6 Alternate Proposal (or Alternate): An amount stated in the Proposal to be added to, or deducted from, the amount of the Base Proposal if the corresponding change in the Work, as described in the Proposal, is accepted by the Owner.

1.7 Unit Price: An amount stated in the Proposal as a price per unit of measurement to add or delete for labor, materials, and equipment or services or a portion of the Work as described in the Proposal Documents.

1.8 Proposer: A person or entity who submits a Proposal. Proposer, contractor, and General Contractor shall have the same meaning and be interchangeable.

1.9 Safety Record: A proposer's OSHA (Occupational Safety and Health Administration) inspection logs for the last three years, a loss analysis from the Proposer's insurance carrier, and a loss history covering all lines of insurance coverage carried by the proposer.

1.10 Architect/Engineer: the term determines that architect/engineer shall have the same meaning and be interchangeable.

1.11 Bid Bond/Proposal Bond/Proposal Security: shall have the same meaning and be interchangeable.

ARTICLE 2. PROPOSER'S REPRESENTATIONS

2.1 The Proposer by making a Proposal represents that:

2.1.1 The Proposer has read and understands the Proposal Documents and the Proposal is made in accordance therewith.

2.1.2 The Proposer has visited the site; has become familiar with local conditions under which the Work is to be performed; and has correlated the Proposer's personal observations with the requirements of the Proposal Documents.

2.1.3 The Proposal is based upon the materials, equipment and systems required by the Proposal Contract Documents without exception.

ARTICLE 3. PROPOSAL DOCUMENTS

3.1 Copies

3.1.1 Proposers may obtain complete sets of the Proposal Documents from the issuing office designated in the Advertisement for Sealed Proposals in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Proposers who return the Documents to the issuing office in good condition and in good order within ten days after proposal opening. The cost of replacement of missing or damaged Documents will be deducted from the deposit. A Proposer receiving a Contract award may retain the Documents and the Proposer's deposit will be refunded.

3.1.2 Proposal Documents will not be issued for deposit directly to Sub-proposers or others unless specifically offered in the Advertisement for Sealed Proposals, or in the Instructions to Proposers.

3.1.3 Additional complete sets of Proposal Documents, if available, may be obtained by Proposers and Sub- proposers from the issuing office for the cost of reproduction and mailing, which costs are not refundable. It shall be understood by entities obtaining additional sets and paying the reproduction and mailing costs that such additional sets remain the Owner's exclusive property and shall be returned to the office from where the Proposal Documents were issued.

3.1.4 Proposal Documents will also be issued to plan rooms in those cities which are likely to be home locations of Proposers and Sub-proposers.

3.1.5 Proposers shall use complete sets of Proposal Documents in preparing Proposals; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

3.1.6 In making copies of the Proposal Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Proposals on the Work; and do not confer a license or grant permission for any other use of the Proposal Documents.

3.2 Interpretation or Correction of Proposal Documents

3.2.1 The Proposer shall carefully study and compare the Proposal Documents with each other, and with other work being proposed concurrently or presently under construction to the extent that it relates to the Work for which the Proposal is submitted; shall examine the site and local conditions; and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

3.2.2 Proposers and Sub-proposers requiring clarification or interpretation of the Proposal Documents shall make a written request which shall reach the Architect at least 10 working days prior to the date for receipt of Proposals.

3.2.3 Interpretations, corrections and changes of the Proposal Documents will be made by addendum. Interpretations, corrections and changes of the Proposal Documents made in any other manner will not be binding, and Proposers shall not rely upon them.

3.3 Substitutions

3.3.1 The materials, products and equipment described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

3.3.2 No substitution will be considered prior to receipt of Proposals unless a written request for approval has been received by the Architect at least ten days prior to the date for receipt of Proposals. Such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work (including changes in the work of other contracts that incorporation of the proposed substitution would require) shall be included. The burden of proof of the merit of the proposed substitution is upon the Proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

3.3.3 If the Architect approves a proposed substitution prior to receipt of Proposals, such approval will be set forth in an Addendum. Proposers shall not rely upon approvals made in any other manner.

3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Proposal Documents.

3.4 Addenda

3.4.1 Addenda will be mailed, faxed or Contractor shall pick up to those known by the issuing office to have received a complete set of Proposal Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Proposal Documents are on file for that purpose.

3.4.3 Each Proposer shall ascertain prior to submitting a Proposal that the Proposer has received all Addenda issued; and the Proposer shall acknowledge their receipt on the Proposal Form.

3.4.4 Additional complete sets of Proposal Documents, if available, may be obtained by Proposers and Sub- proposers from the issuing office for the cost of reproduction and mailing, which costs are not refundable. It shall be understood by entities obtaining additional sets and paying the reproduction and mailing costs that such additional sets remain the Owner's exclusive property and shall be returned to the office from where the Proposal Documents were issued.

3.4.5 Proposal Documents will also be issued to plan rooms in those cities which are likely to be home locations of Proposers and Sub-proposers.

3.4.6 Proposers shall use complete sets of Proposal Documents in preparing Proposals; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

3.4.7 In making copies of the Proposal Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Proposals on the Work; and do not confer a license or grant permission for any other use of the Proposal Documents.

3.5 Interpretation or Correction of Proposal Documents

3.5.1 The Proposer shall carefully study and compare the Proposal Documents with each other, and with other work being proposed concurrently or presently under construction to the extent that it relates to the Work for which the Proposal is submitted; shall examine the site and local conditions; and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

3.5.2 Proposers and Sub-proposers requiring clarification or interpretation of the Proposal Documents shall make a written request which shall reach the Architect at least 10 working days prior to the date for receipt of Proposals.

3.5.3 Interpretations, corrections and changes of the Proposal Documents will be made by addendum. Interpretations, corrections and changes of the Proposal Documents made in any other manner will not be binding, and Proposers shall not rely upon them.

3.6 Substitutions

3.6.1 The materials, products and equipment described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

3.6.2 No substitution will be considered prior to receipt of Proposals unless a written request for approval has been received by the Architect at least ten days prior to the date for receipt of Proposals. Such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work (including changes in the work of other contracts that incorporation of the proposed substitution would require) shall be included. The burden of proof of the merit of the proposed substitution is upon the Proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

3.6.3 If the Architect approves a proposed substitution prior to receipt of Proposals, such approval will be set forth in an Addendum. Proposers shall not rely upon approvals made in any other manner.

3.6.4 No substitutions will be considered after the Contract award unless specifically provided for in the Proposal Documents.

3.7 Addenda

3.7.1 Addenda will be mailed, faxed or Contractor shall pick up to those known by the issuing office to have received a complete set of Proposal Documents.

3.7.2 Copies of Addenda will be made available for inspection wherever Proposal Documents are on file for that purpose.

3.7.3 Each Proposer shall ascertain prior to submitting a Proposal that the Proposer has received all Addenda issued; and the Proposer shall acknowledge their receipt on the Proposal Form.

ARTICLE 4. PROPOSAL PROCEDURES

4.1 Form and Style of Proposals

4.1.1 Proposals shall be submitted on forms included with the Proposal Documents.

4.1.2 All blanks on the Proposal Form shall be filled in electronically or manually in ink.

4.1.3 Where so indicated by the makeup of the Proposal Form, sums shall be expressed in both words and figures, and in cases of discrepancy between the two, the amount written in words shall govern.

4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Proposal.

4.1.5 All requested Alternates shall be proposed. If no change in the Base Proposal is required, enter "No Change."

4.1.6 Where two or more Proposals for designated portions of the Work have been requested, the Proposer may, without forfeiture of the proposal security, state the Proposer's refusal to accept award of less than the combination of Proposals stipulated by the Proposer. The Proposer shall make no additional stipulations on the Proposal Form nor qualify the Proposal in any other manner.

4.1.7 Each copy of the Proposal shall include the legal name of the Proposer and a statement that the Proposer is a sole proprietor, partnership, corporation or other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Proposer to a contract. A Proposal by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Proposal submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Proposer.

4.1.8 To be considered complete, the Proposal shall include the following attributes, line items and/or forms completely and accurately filled out and executed:

- Proposal (including Unit Prices and Alternate Proposals if applicable)
- Proposal Bond - 10%
- Felony Conviction Notice
- Affidavit of Non-Collusion
- Certificate of Residency
- Verification of Business Type
- Conflict of Interest Questionnaire
- Contractor's Proposed Project Personnel
- Antitrust Certification Statement
- Form 1295 – Certificate of Interested Parties
- Contract Documents Deviations and Exceptions
- Request for Taxpayer Identification Number and Certification (W9_
- Conflict of Interest Questionnaire (form)
- Certificate of Interested Parties Form 1295 (form)
- State and Federal Certification Form
- Certification of Criminal History Record Information
- Subcontractor Listing

4.1.9 For additional proposal information and requirements refer to the following:

Proposal Phase Procedures
Contractor Proposed Project Personnel

4.2 Proposal Bond and Insurance

4.2.1 If so stipulated in the Advertisement for Sealed Proposals, or the Instructions to Proposers, each Proposal shall be accompanied by a Proposal Security in the form and amount required, pledging that the Proposer will enter into a Contract with the Owner on the terms stated in the Proposal and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Proposer refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the Proposal Security shall be forfeited to the Owner as liquidated damages, not as a penalty.

4.2.2 If a Proposal Bond is required it may be written on the Owner's standard form, a copy of which is included with the Proposal Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

4.2.3 The Owner will have the right to retain the Proposal Security of Proposers to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Proposals may be withdrawn, or (c) all Proposals have been rejected.

4.2.4 The Proposer shall provide the required insurance prior to the issuing of the Notice to Proceed. Should the Proposer fail to furnish such Insurance, the amount of the Proposal Security shall be forfeited to the Owner as liquidated damages, not as a penalty.

4.3 Submission of Proposals

4.3.1 All copies of the Proposal, the Proposal Security, if any, and other documents required to be submitted with the Proposal shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Proposals and shall be identified with the Project Name, the Owner's Project Number, the Proposer's name and address and if applicable, the designated portion of the Work for which the Proposal is submitted, If the Proposal is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED PROPOSAL ENCLOSED" on the face thereof.

4.3.2 Proposals shall be deposited at the designated location prior to the time and date for receipt of Proposals. Proposals received after the time and date for receipt of Proposals will be returned unopened.

4.3.3 The Proposer shall assume full responsibility for timely delivery at the location designated for receipt of Proposals.

4.3.4 Oral, telephonic, telegraphic Proposals or revisions noted on the outside of the sealed opaque envelope are invalid and will not receive consideration.

4.4 Modification or Withdrawal of Proposal.

4.4.1 A Proposal may not be modified, withdrawn or canceled by the Proposer for a period of sixty (60) calendar days following the time and date designated for the receipt of Proposals, and each Proposer so agrees in submitting a Proposal.

4.4.2 Prior to the time and date designated for receipt of Proposals, a Proposal submitted may be modified or withdrawn by notice to the party receiving Proposals at the place designated for receipt of Proposals. Such notice shall be in writing over the signature of the Proposer or by telegram. If by telegram, written confirmation over the signature of the Proposer shall be mailed and postmarked on or before the date and time set for receipt of Proposals. A change shall be so worded as not to reveal the amount of the original Proposal.

4.4.3 Withdrawn Proposals may be resubmitted up to the date and time designated for the receipt of Proposals provided that they are then fully in conformance with these Instructions to Proposers.

4.4.4 Proposal Security, if required, shall be in an amount sufficient for the Proposal as modified or resubmitted.

ARTICLE 5. PRE & POST PROPOSAL INFORMATION

5.1 Submittals

5.1.1 Upon request by the Owner, Proposers shall provide the following:
.1 a designation of the Work to be performed with the Proposer's own forces;
.2 names of the manufacturers, products and the suppliers of principal items or systems of materials and equipment proposed for the Work; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

5.1.2 The Proposer will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Proposal Documents.

5.1.3 Prior to the award of the Contract, the Architect will notify the Proposer in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Proposer. If the Owner or Architect has reasonable objection to a proposed person or entity, the Proposer may at the Proposer's option (1) withdraw the Proposal, or (2) submit an acceptable substitute person or entity with an adjustment in the Base Proposal or Alternate Proposal to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted proposal price or disqualify the Proposer. In the event of either withdrawal or disqualification, Proposal Security will not be forfeited.

5.1.4 Persons and entities proposed by the Proposer, and to whom the Owner and Architect have made no reasonable objection, must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 6. CONSIDERATION OF PROPOSALS

6.1 Opening of Proposals

6.1.1 Unless stated otherwise in the Advertisement for Sealed Proposals, the properly identified Proposals received on time will be opened publicly and will be read aloud. An abstract of the Proposals will be made available to Proposers.

6.2 Rejection of Proposals

6.2.1 The Owner shall have the right to reject any or all Proposals, reject a Proposal not accompanied by a required Proposal Security or by other data required by the Proposal Documents, or reject a Proposal which is in any way incomplete or irregular.

6.3 Acceptance of Proposals (Award)

6.3.1 It is the intent of the Owner to award a Contract to the Proposer deemed to be in the best interests of Galena Park I.S.D. provided the Proposal has been submitted in accordance with the requirements of the Proposal Documents and does not exceed the funds available. The Owner shall have the right to waive informalities or irregularities in a Proposal received and to accept the Proposal which, in the Owner's judgment, is in the Owner's own best interests.

6.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Proposal Documents, and to determine the low Proposer on the basis of the sum of the Base Proposal and Alternates accepted.

6.4 The Owner will use the following criteria with respect to evaluating the proposals:

Criteria	Percent
Purchase Price (Line Items)	40
Reputation, quality, and long-term value to the Owner (Warranty) of the Proposer's goods and services, and safety record of the proposer. (Exhibit A, B, C, D & E - A305 and References)	20
Qualifications of the Proposers proposed project team (Proposed Project Personnel Attribute, Qualification Statement, & Exhibit C - A305)	10
Qualifications and reputation of the Proposer's proposed subcontractors (Subcontractor Listing Line Item)	15
Proposed Schedule	10
Small Business Participation Commitment	5

ARTICLE 7. PERFORMANCE AND PAYMENT BONDS

7.1 Bond Requirements

7.1.1 If stipulated in the Proposal Documents, the Proposer shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Proposer's usual sources.

7.1.2 If the furnishing of such bonds is stipulated in the Proposal Documents, the cost shall be included in the Proposal.

7.2 Time of Delivery and Form of Bonds

7.2.1 The Proposer shall deliver the required bonds to the Owner not later than ten days following the date of execution of the Contract.

7.2.2 Unless otherwise provided, the bonds shall be written on the Owner's standard forms for performance and payment bonds, copies of which are included in the Proposal Documents. Both bonds shall be written in the amount of the Contract Sum.

7.2.3 The bonds shall be dated on or after the date of the Contract.

7.2.4 The Proposer 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.

ARTICLE 8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 Form to be used

8.1.1 The Agreement for the Work will be written on the Owner's standard form of agreement, a copy of which is included in the Proposal Documents.

8. PROJECT INFORMATION

Project:	**Galena Park ISD Multi-Use Facility**
Project Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**
Total Project Budget:	**$26,960,000**
Substantial Completion Date:	**August 1, 2027**

The Architect/Engineer is:	**VLK Architects**
	20445 State Highway 249; Suite 350; Houston, Texas 77070
Contact Name:	**Tam Quong**
Contact Email:	**tquong@vlkarchitects.com**

9. PROPOSAL ACKNOWLEDGEMENT

Having carefully examined the Proposal Documents for the Project and all Addenda thereto, as well as the site of the proposed Work and all the conditions affecting the Work, the undersigned proposes to furnish all labor, materials, services and equipment necessary to complete the entire Work in accordance with the Proposal Documents for the sums submitted on the Proposal Lines tab.

BASE PROPOSAL: The undersigned agrees to perform all work required by the Proposal Documents which is not specifically indicated to be proposed as an Alternate.

ALTERNATE PROPOSALS: If the Owner elects to require increases, decreases or changes in the Work specifically described in the Proposal Documents as Alternates, the undersigned agrees to perform such increases, decreases or changes for the sums stated below. The undersigned also understands that the Owner reserves the right to accept or reject any alternate proposal in the order of its choosing and to suit available funding.

The undersigned further agrees, if awarded the Contract, to complete all work required by the Proposal Documents in the number of calendar days after Notice to Proceed or by the specific date stipulated in the Proposal Documents.

The undersigned further agrees that the Proposal Security, payable to the Board of Trustees of the Galena Park Independent School District, accompanying this proposal is left in escrow with the Chief Finance Officer of the Galena Park Independent School District; that its amount is measure of the liquidated damages which the Owner will sustain by the failure of the undersigned to execute and deliver the above named Agreement and Bonds, and that if the undersigned defaults in executing that Agreement or in furnishing the Performance and Payment Bonds or insurance certificates within the stipulated time period following the written notification of the award of the Contract, then the check shall become the property of the Owner, or the Proposal Bond shall become subject to forfeiture to the Owner.

It is understood that the Owner reserves the right to accept or reject any and all Proposals and to waive formalities or irregularities as it deems to serve its best interests. It is further agreed that this Proposal shall be valid and not withdrawn within a period of sixty (60) days from the date of opening thereof. Withdrawal of Proposal within the stipulated sixty-day period may result in the forfeiture of the Proposal Security.

The work to be performed under this Contract shall be commenced within ten (10) days from the date of the Notice to Proceed issued by the Owner and the Contractor shall achieve Substantial Completion within the time stipulated in the Supplementary Conditions of the Contract, subject to adjustments of this Contract Time as provided elsewhere in the Proposal Documents. The time set forth for completion of the Work is an essential element of the Contract.

10. PROPOSAL BOND FOR BUILDING CONSTRUCTION CONTRACTS

Proposal Bond for Building Construction Contracts

A. Each individual Proposal package submitted must be accompanied by Bid Bond made payable to Owner in an amount of ten percent (10%) of the Proposal price (for Proposal bond purposes, the Proposal price shall include the base Proposal, plus all alternates; however, the Contract price shall be as awarded by Galena Park Independent School District). Proposal Bond shall be in the form of a Cashier's Check or a Proposal Bond, duly executed by proposer as principal and having as surety thereon, a corporate surety company duly authorized and admitted to do business in the State of Texas and licensed by the State of Texas to issue such bond, as a guarantee that the proposer will enter into a Contract and execute required Performance and Payment Bonds within ten (10) days of Galena Park Independent School District award of Contract.

B. Each Proposal must be accompanied by information establishing that the agent signing the bond is authorized to write the bond in the amount requested, and if applicable, that reinsurance requirements, have been met, including limits and ratings or other evidence of company solvency.

C. Proposer must demonstrate to Owner that he can secure required bonds, issued by a corporate surety company authorized and admitted to do business in the State of Texas and licensed in the State of Texas to issue such bond, which bonds shall be written in the form contained in the Project Manual without modification.

11. PROPOSAL PHASE PROCEDURES

Proposer Qualification Statements
Conditions of the Contract, Supplementary Conditions and Division 1 Apply to this section.

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section contains procedures to be followed by general contractor proposers and sub-contractors / material suppliers during the proposal phase of the project.

1.2 RELATED WORK

A. All sections of specifications contained in the Project Manual.
B. All drawings issued as Contract Documents
C. All Addenda issued during the proposal phase.

1.3 SUBMITTALS

A. Qualification Statements
B. Project Lists
C. References

1.4 QUALITY ASSURANCE

A. The Proposer's Qualification Statement, including accompanying documents, is the primary tool used in the Competitive Sealed Proposal evaluation process. It is the Proposer's opportunity to demonstrate their strengths and qualifications.
B. It is the Proposer's sole responsibility to provide complete information on all required submittal documents.
C. It is the Proposer's sole responsibility to provide reference information that is current, accurate and viable; in that the references submitted shall respond.
    01 Evaluation requests for reference input shall be distributed to references by fax or email.
    02 No attempt shall be made by the Architect to correct inaccurate information submitted by the Proposer.
    03 Non-responses from Proposer's references shall have a negative impact on the Proposer in the evaluation process.
D. It is the Proposer's sole responsibility to provide Qualification Statement, including accompanying documents in a timely manner to allow ample time for reference inquiries and responses, and other evaluation processes.
    01 No attempt shall be made by the Architect to expedite responses from references submitted by the Proposer.
    02 Non-responses from Proposer's references shall have a negative impact on the Proposer in the evaluation process.

PART 2 – PROCEDURES

2.1 PROPOSER QUALIFICATION STATEMENTS

A. Proposer Qualification Statements are the primary vehicle used by the project evaluation members to assess the credentials of the Proposer with respect to evaluation criteria set forth in the Project Manual leading to the recommendation for award of Contract.
    01 It is the sole responsibility of the Proposer to assure the information provided as reference is accurate, current, useful and verifiable.
B. In order to receive full consideration during the proposal evaluation period, each Proposer

must submit a completed Qualification Statement (AIA Document A305) to the Architect and Owner according to the "Submission Required PRIOR to Proposal Opening" attribute.

01 Qualification Statements received after the "Submission Required PRIOR to Proposal Opening" deadline shall be accepted and processed; however, the proposer shall bear any / all consequences of a less than adequate evaluation due to a late submission.

02 Fax submissions will not be accepted.

C. In addition to the information required in AIA A305 Qualification Statement, each proposer shall submit the following specific information attached to the Qualification Statement:

01 A list of at least five (5) projects of similar scope as the project being proposed on which have been completed in the last five (5) years. Referenced projects to include the following information:

a. Project Name and Location
b. Project Completion Date
c. Final Project Cost
d. Owner's Name and Contact Information (current phone number, fax number, and email address.).
e. Architect's Project Manager Name and Contact Information (current phone number and fax number).

02 A list of at least five (5) references of Owners and five (5) Architects which the proposer has completed work for in the last five (5) years including the following information:

a. Name and Contact Information (current phone number, and email address).

03 A list of all projects completed in the last three (3) years including the following information:

a. Project Name and Location
b. Project Completion Date
c. Final Project Cost
d. Owner's Name and Contact Information (current phone no.).
e. Architect's Project Manager Name and Contact Information (current phone no.).

D. Any other information the Proposer wishes to submit to be used in the evaluation process.

2.2 ELECTRONIC AVAILABILITY OF PROPOSAL DOCUMENTS

A. Proposal documents – drawings, specifications and addenda – shall be posted on the GPISD website at https://www.galenaparkisd.com/Page/1155 and ionwave.

B. Proposal documents – drawings, specifications and addenda – shall be posted in the following plan rooms:
isqft.com and virtualbx.com

2.3 PROPOSAL PHASE - REQUEST FOR INFORMATION

A. All Requests For Information (RFI) during the Proposal Phase should be made in writing (email preferred). Requests by telephone shall be accepted only at the discretion of the recipient.

B. Proposal RFI's should be made directly to the responsible party/consultant per the project information attribute.

C. All Proposal RFI's shall be responded to in writing by return fax or email only to the original sender.

D. Official changes to the Contract Documents originating from Proposal RFI's shall be issued by Addendum

2.4 ADDENDA

A. All Addenda shall be issued by the Architect/Engineer on record.
B. Generally, each Addendum shall be limited to a single discipline (Architectural, MEP, Civil, Structural, etc.), containing only Contract Document changes relative to that discipline.
C. All Addenda shall be issued and posted to the district website at https://www.galenaparkisd.com/Page/1155.

12. FELONY CONVICTION NOTICE

Felony Conviction Notice

State of Texas Legislative Senate Bill No.1, Section 44.034, Notification of Criminal History, Subsection (a), states “A person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony.” Subsection (b) states “A school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract.” Is your firm owned or operated by anyone who has been convicted of a felony?

Subsection (c) states, “This notice is not required of a publicly held corporation.”

- ☐ My firm is publicly held corporation; therefore, this reporting requirement is not applicable.
- ☐ My firm is not owned or operated by anyone who has been convicted of a felony.
- ☐ My firm is owned or operated by the following individual(s) who has/have been convicted of a felony

(Required: Check only one)

Felony Conviction Details

If your firm is owned or operated by anyone who has been convicted of a felony, please list

- name(s)
- date(s) of conviction(s)
- details of the conviction(s)

If not applicable, please enter N/A (not applicable).

13. AFFIDAVIT OF NON-COLLUSION

Anti-Collusion Statement

The undersigned affirms that they are duly authorized to execute this proposal, that this company, corporation, firm, partnership or individual has not prepared this proposal in collusion with any other proposer, and that the contents of this proposal as to prices, terms or conditions of said proposal 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 proposal.

☐ I agree.

14. CERTIFICATE OF RESIDENCY

Certificate of Residency
The State of Texas has passed a law concerning non-resident contractors. This law makes it necessary for the Galena Park Independent School District to determine the residency of its proposers. This law can be found in Vernon's Annotated Civil Statutes as Article 601g, Sections 1 and 2. It reads:

"Section 1 (a) (2) "Non-resident Proposer means a Proposer whose principal place of business is not in this state but excludes a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

"Section 1 (a) (3) "Texas resident Proposer means a Proposer whose principal place of business is in this state and includes a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

“Section 1(b) The state or governmental agency of the state may not award a contract for general construction, improvements, services, or public works projects or purchases of supplies materials or equipment to a non-resident Proposer unless the non-resident's Proposal is lower than the lowest Proposal submitted by a responsible Texas resident Proposer by the same amount that a Texas resident Proposer would be required to underbid a non-resident Proposer to obtain a comparable contract in the state in which the non-resident's principal place of business is located."

Please select one of the following:
(Required: Check only one)

- ☐ My company is a Resident Proposer
- ☐ My company is a Nonresident Proposer

Certificate of Residency

Enter the **city** and **state** of the principal place of business (under Article 601g).

_____

_____

_____

_____

15. VERIFICATION OF BUSINESS TYPE

Verification of Business Type
(Required: Check only one)

- ☐ Sole Proprietor
- ☐ Partnership
- ☐ Corporation (provide state of incorporation)
- ☐ Other (provide detail in next attribute)

Verification of Business Type

Provide state of incorporation or additional details if applicable

16. CONFLICT OF INTEREST QUESTIONNAIRE

Conflict of Interest Questionnaire

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session. Instructions on filling out this form are included in the Proposal invitation.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section176.006(a-1), Local Government Code.

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

Local government officers:

Board of Trustees & Superintendent of Schools

Name	**Position**
Ramon Garza	President
Linda Clark Sherrard	Vice President
Jose Jimenez	Secretary
Adrian Stephens	Board Trustee
Noe Esparza	Board Trustee
Norma Hernandez	Board Trustee
Amanda Erebia	Board Trustee
Dr. John C. Moore	Superintendent of Schools

Does this vendor have a conflict of interest with Galena Park Independent School District?
(Required: Check only one).

- ☐ Yes
- ☐ No

17. CONTRACTOR'S PROPOSED PROJECT PERSONNEL

Contractor's Proposed Project Personnel
An item of the evaluation criteria used to select the successful general contractor to perform this work is the qualifications of the Contractor's project team proposed to be assigned to this project. Please submit the names of the personnel in the spaces provided.

Principal in Charge

_____

_____

Project Manager

_____

_____

Assistant Project Manager (as applicable)

_____

_____

Construction Superintendent

_____

_____

Assistant Superintendent (as applicable)

_____

_____

18. ANTITRUST CERTIFICATION STATEMENT

Antitrust Certification Statement

Per 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)
2. In connection with this Proposal, 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 Proposal, 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 Proposal 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.

(Required: Check only one)

- ☐ Agree
- ☐ Do Not Agree

19. FORM 1295 - CERTIFICATE OF INTERESTED PARTIES

Form 1295 - Certificate of Interested Parties

Pursuant HB 1295, the addition of section 2252.908 of the Government Code, all awarded vendors must fill out electronically, with the Texas Ethics Commission's online filing application. www.ethics.state.tx.us.whatsnew/elf_info_form1295.htm

The law states that a governmental entity or state may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties (Form 1295) to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental or state agency. The Texas Ethics Commission has adopted rules requiring the business to file Form 1295 electronically with the Commission.

This form must then be signed and returned, prior to any business transaction.

Please note the following:
Box 2: Please enter Galena Park ISD
Box 3: Please use CSP# 25-603 as the identification number being requested and Galena Park ISD Multi-Use Facility as description of goods or services.

Please acknowledge that you have read and understand that the district may not do business with your company without the submittal of this form.

(Required: Check only one)

- ☐ Yes
- ☐ No

20. CONTRACT DOCUMENTS DEVIATIONS OR EXCEPTIONS

Contract Documents (Sample Contract Documents)
The Contract Documents (Sample Contract Documents) are provided, please check if you agree or disagree to the Terms of the Agreement as presented. This is your electronic signature.

(Required)

☐ I have Read and Agree

No Deviations or Exceptions
I certify that there are NO deviations or exceptions from the attached specific terms, conditions, and specifications.

(Required: Check only one)

☐ Agree - No Deviations
☐ Do Not Agree - Please see below

Deviations and Exceptions
If your company intends to deviate from the Specifications listed in the attached documents, all such deviations and exceptions must be listed here, with complete and detailed conditions and information included. The District will consider any deviations or exceptions in its Proposal award decisions. The District reserves the right to accept or reject any proposals based upon any deviations indicated below. If none, please enter N/A (Not Applicable).

Proposal Lines

BASE PROPOSAL

Item Notes: The undersigned agrees to perform all work required by the Proposal Documents which is not specifically indicated to be proposed as an Alternate for the sum of:

1.1 BASE PROPOSAL: **$** _____

1.2 Owner's Contingency Allowance: **960,000**

1.3 Base Proposal + Owner's Contingency Total: **$** _____

_____

(Written Total Amount)

Acknowledge Addendum(s)

Acknowledge receipt of Addendum 1 through _____

Alternate Proposal Lines

ALTERNATES PROPOSAL

Alternate No. 1
(Response required)

1 BASE PROPOSAL REDUCTION: **$** _____

Item Notes: If there is a discount to the Base Proposal enter that amount here.

Alternate No. 2 **$** _____
(Response required)

State in the proposal form the amount to be added to the base proposal for providing a 120-yard indoor practice facility in lieu of an 80-yard indoor practice facility.

Alternate No. 3 **$** _____
(Response required)

State in the proposal form the amount to be added to the base proposal for providing the renovation of the coach's offices and training area in existing field house. Lavatory replacement in these areas are to be provided in the base bid and not to be included in this alternate

Alternate No. 4 **$** _____
(Response required)

State in the proposal form the amount to be added into the base proposal for providing the brick veneer and metal wall panel system in the existing field house.

Alternate No. 5 - State in the proposal form the amount to be added to the base proposal to furnish and install the following Air Handling Units as listed in the specifications. Include estimated lead time/delivery to be assessed as part of the selection process.
(Response required)

5a Carrier **$** _____

5b Temtrol **$** _____

5c Trane **$** _____

Alternate No. 6 - State in the proposal form the amount to be added to the base proposal to furnish and install the following Chillers as shown in the Contract Documents. Include estimated lead time/delivery to be assessed as part of the selection process
(Response required)

6aCarrier Standard Efficiency Chillers **$** _____

6b Carrier High Efficiency Chillers **$** _____

6c Trane Standard Efficiency Chiller **$** _____

6d Trane High Efficiency Chillers **$** _____

6e York Standard Efficiency Chillers **$** _____

6f York High Efficiency Chiller **$** _____

Alternate No. 7 - State in the proposal form the amount to be added to the base proposal to furnish and install the following BMCS system
(Response required)

7a Reliable Controls by Unify Energy Solutions **$** _____

7b Trane Controls by Hunton Group **$** _____

7c ALC by Automated Logic Houston **$** _____

Alternate No. 8 - State in the proposal form the amount to be added to the base proposal to furnish and install the turf for the indoor practice facility.
(Response required)

8a FieldTurf **$** _____

8b Hellas **$** _____

8c Mammoth **$** _____

Alternate No. 9 - State in the proposal form the amount to be added to the base proposal to furnish and install the turf in the new weight room.
(Response required)

9a FieldTurf **$** _____

9b Hellas **$** _____

9c Mammoth **$** _____

Alternate No. 10 - State in the proposal form the amount to be added to the base proposal to furnish and install the rubber flooring in the new weight room. The amount should include both rubber flooring and turf.
(Response required)

10a Tarkett **$** _____

10b ProMaxima **$** _____

10c Mondo **$** _____

UNIT PRICES

Unit Price 01: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

Unit Price 02: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

Unit Price 03: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

Unit Price 04: [INSERT]
(Line excluded from response total)

Description: [INSERT]
(Response required)

ADD/DELETE: **$** _____

SUBCONTRACTOR LISTING

(Line excluded from response total)

Item Notes: One of the evaluation criteria used to select the successful General Contractor is the proposed project team, including sub-contractors to be used for the Work. In order to receive consideration for the award of the Contract, each Proposer must submit a list of sub-contractors proposed be used for the Work.

Recognizing the Proposer may not have firm contractual agreements with sub-contractors immediately following submission of Proposals, an allowance is made to submit two (2) sub-contractors for each trade listed below.

Package Attributes

1. Self-Performed

Will your company be self-performing ALL work.

- ☐ Yes, all work is self-performed
- ☐ No, we will use subcontractors

(Required: Check only one)

Mechanical Primary _____

Mechanical Secondary _____

Electrical Primary _____

Electrical Secondary _____

Plumbing Primary _____

Plumbing Secondary _____

Site Work Primary _____

Site Work Secondary _____

Site Utilities Primary _____

Site Utilities Secondary _____

Concrete Primary _____

Concrete Secondary _____

Masonry Primary _____

Masonry Secondary _____

Steel Fabrication Primary _____

Steel Fabrication Secondary _____

Steel Erection Primary _____

Steel Erection Secondary _____

Dampproofing Primary _____

Dampproofing Secondary _____

Fire Sprinkler Primary _____

Fire Sprinkler Secondary _____

Roofing Primary _____

Roofing Secondary _____

Hollow Metal Primary _____

Hollow Metal Secondary _____

SCPL Doors Primary _____

SCPL Doors Secondary _____

Finish Hardware Primary _____

Finish Hardware Secondary _____

Glass & Glazing Primary _____

Glass & Glazing Secondary _____

Gyp Bd Systems Primary _____

Gyp Bd Systems Secondary _____

Ceramic Tile Primary _____

Ceramic Tile Secondary _____

Flooring Primary _____

Flooring Secondary _____

Painting Primary _____

Painting Secondary _____

Toilet Partitions Primary _____

Toilet Partitions Secondary _____

Toilet Acc's. Primary _____

Toilet Acc's. Secondary _____

Casework Primary _____

Casework Secondary _____

Fire Alarm Primary _____

Fire Alarm Secondary _____

BCMS Primary _____

BCMS Secondary _____

Data / Tech Primary _____

Data / Tech Secondary _____

Security Primary _____

Security Secondary _____

Small Business Enterprise Program (SBEP)

Item Notes: The Small Business Enterprise Program (SBEP) provides increased business opportunities for small businesses to participate in contracting and procurement opportunities with the District. The SBEP is a goal-oriented program, requiring contractors to whom the District awards prime contracts for architectural design services, engineering design services, or construction services valued at $50,000 or greater to use good-faith efforts to utilize small business subconsultants, subcontractors, and suppliers.

To be eligible as a small business under the SBEP, a business shall:

1. Demonstrate that the firm's gross revenues or number of employees averaged over the past three years, inclusive of any affiliates as defined by 13 C.F.R. 121.103, does not exceed the size standards as defined pursuant to Section 3 of the Small Business Act and 13 C.F.R. 121.201.

2. Have or be eligible for one of the following small business certifications:
   a. Port of Houston Authority SBE Certification (not including any location requirement);
   b. Metropolitan Transit Authority of Harris County (METRO) SBE Certification (not including any location requirement);

In eligible procurements, the District may award additional scoring points to a Proposer or proposer based on its SBEP participation. The District may likewise consider a Proposer or proposer's failure to achieve SBEP participation commitments on previous District projects when scoring a subsequent Proposal. Any weighted point values available to a Proposer or proposer related to SBEP participation shall be published with all other weighted selection criteria in the procurement solicitation.

The respondent to this CSP shall list their Small Business prime contact or sub-contract participation goal /commitment percentage (0%-100%) of their total contract.

1. Provide the Small Business prime contract or sub-contract participation goal /commitment percentage (0%-100%).

(Response required)

Participation goal /commitment percentage (0%-100%) _____

Galena Park ISD Small Business Enterprise Proposal Sheet		
Proposed Subcontractor	**SBE Certification No**	**Amount of Work Proposed**
Total Goal/Commitment		**$**

Small Business Enterprise (SBE) Participation Scoring Criteria:

Contractors will be awarded points based on their level of Small Business Enterprise (SBE) participation as follows:

- Greater than 10% Participation: Full 5 points will be awarded
- Between 5% and 10% Participation: 3 out of 5 points will be awarded.
- Less than 5% Participation: 1 out of 5 points will be awarded

Contractor Information

Company Name: _____

Contact Name: _____

Address: _____

_____

Phone: _____

Fax: _____

Email: _____

Contractor Notes:

_____

_____

The undersigned, in submitting this Proposal and endorsement of same, represents that he/she is authorized to obligate his/her Firm, that he/she is an equal opportunity employer and will not discriminate with regard to race, color, religion, sex, national origin, age or disability unrelated to job performance of this Proposal; that he/she will abide by all the policies and procedures of Galena Park ISD; and that he/she has read this entire Proposal package, is aware of the covenants contained herein and will abide by and adhere to the expressed requirements in ALL sections of this Proposal.

Print Name _____ Signature_____

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

► **Go to *www.irs.gov/FormW9* for instructions and the latest information.**

Give Form to the requester. Do not send to the IRS.

Print or type. See **Specific Instructions** on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ► _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ►

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN,* later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

			–			–				

or

Employer identification number

		–							

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here	**Signature of U.S. person** ►	**Date** ►

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9.*

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and

4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting,* later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the instructions for Part II for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code,* later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships,* earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code,* later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester,* later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at *www.SSA.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/Businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. Go to *www.irs.gov/Forms* to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to *www.irs.gov/OrderForms* to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code,* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account[1]
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor[2]
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee[1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner[1]
6. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	**Give name and EIN of:**
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity[4]
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships,* earlier.

***Note:** The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov.* You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at *spam@uce.gov* or report them at *www.ftc.gov/complaint.* You can contact the FTC at *www.ftc.gov/idtheft* or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see *www.IdentityTheft.gov* and Pub. 5027.

Visit *www.irs.gov/IdentityTheft* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

SAMPLE

FORM CIQ

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

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

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

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

OFFICE USE ONLY

Date Received

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

Company/Independent Contractor's Name

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

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

Enter "N/A" if there is no employment of business relationship

Name of Officer

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

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

☐ Yes ☐ No **At least one box must be checked**

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

☐ Yes ☐ No **At least one box must be checked**

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

If a relationship exists, please describe it here

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

7 **Signature**

Signature of vendor doing business with the governmental entity

Date

Date

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

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

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

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

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

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

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

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

***

(2) the vendor:

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

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

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

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

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

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

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

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

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

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

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

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

(1) the date that the vendor:

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

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

(2) the date the vendor becomes aware:

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

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

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

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

_____

Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

_____ _____

Signature of vendor doing business with the governmental entity Date

CERTIFICATE OF INTERESTED PARTIES FORM 1295

Certificate of Interested Parties (Form 1295) – Must be filled out electronically with the Texas Ethics Commission's online filing application, printed out, signed, and submitted to GPISD with the proposal.

GPISD is required to comply with House Bill 1295, which amended the Texas Government Code by adding Section 2252.908, Disclosure of Interested Parties. Section 2252.908 prohibits GPISD from entering into a contract resulting from this solicitation with a business entity unless the business entity submits a Disclosure of Interested Parties (Form 1295) to GPISD 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:

"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).

"Interested Party" means a person who has a controlling interest in a business entity with whom GPISD contracts or 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).

"Controlling interest" means an Districtship interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent; 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 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).

"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 receives compensation from the business entity for the person's participation; communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract; and is not an employee of the business entity. TEX. ETHICS COMM. RULE 46.3(e).

As a "business entity," unless an exception applies, 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**
    a. All Vendors must complete Form 1295, even if no interested parties exist, unless Vendor is a publicly traded business entity or wholly owned subsidiary of the same, an electric utility or a gas utility.
    b. In Section 2, insert "Galena Park Independent School District"
    c. In Section 3, insert the GPISD RFP/RFQ # 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; and
4. Submit the completed, signed Form 1295 by attaching the form to your proposal.

GPISD must notify the Texas Ethics Commission of the receipt of the filed Form 1295 no later than the 30th day after receipt by GPISD. After GPISD acknowledges the Form 1295, the Texas Ethics Commission is required to post the completed Form 1295 to its website within seven business days after receiving notice from GPISD.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

OFFICE USE ONLY

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

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

Business Company Name

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

Galena Park ISD

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

Bid RFP # and Name of RFP (Co-op Contract optional)

4

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

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____ , on the _____ day of _____, 20_____.
(month) (year)

_____
Signature of authorized agent of contracting business entity
(Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

Must file online at www.ethics.state.tx.us/File

STATE AND FEDERAL CERTIFICATION FORM

Accordingly, the parties agree that the following terms and conditions apply to the Contract between the District and vendor ("Vendor") to the extent applicable to the contract type or dollar amount:

CERTIFICATION REGARDING TERRORIST ORGANIZATIONS & BOYCOTTING OF ISRAEL

Vendor 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. Vendor further certifies and verifies that neither Vendor, nor any affiliate, subsidiary, or parent company of Vendor, if any (the "Vendor Companies"), boycotts Israel, and Vendor agrees that Vendor and Vendor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include terminating business activities or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory.

VERIFICATION REGARDING CONTRACTS WITH COMPANIES THAT BOYCOTT ENERGY COMPANIES

If Vendor is required to make a verification pursuant to Section 2274.002 of the Texas Government Code, Vendor hereby verifies that it does not, and will not for the duration of the contract, boycott energy companies. "Boycott energy company" means, without an ordinary business purpose, 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 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). *[Verification does not apply to a vendor that employs less than 10 full-time employees;* ***AND*** *the value of the contract is less than $100,000 – Note that the term "company" does not include a sole proprietorship.]*

VERIFICATION REGARDING CONTRACTS WITH COMPANIES THAT DISCRIMINATE AGAINST FIREARMS ENTITY OR TRADE ASSOCIATION

If Vendor is required to make a verification pursuant to Section 2274.002 of the Texas Government Code, Vendor hereby verifies that it (1) does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and (2) will not discriminate during the term of the contract against a firearm entity or firearm trade association. *[Verification does not apply to a vendor that employs less than 10 full-time employees;* ***AND*** *the value of the contract is less than $100,000 – Note that the term "company" does not include a sole proprietorship.]*

REQUIRED CONTRACT PROVISIONS FOR NON-FEDERAL ENTITY CONTRACTS UNDER FEDERAL AWARDS APPENDIX II TO 2 CFR PART 200

(A) [*Applicable ONLY to contracts in excess of $250,000.*] **Contracts for more than the simplified acquisition threshold currently set at $250,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.**

Pursuant to Federal Rule (A) above, when the District expends federal funds, the District reserves all rights and privileges under the applicable laws and regulations with respect to this procurement in the event of breach of contract by either party.

(B) [*Applicable ONLY to contracts in excess of $10,000.*] **Termination for cause and for convenience by the grantee or subgrantee including the manner by which it will be affected and the basis for settlement.**

Pursuant to Federal Rule (B) above, when the District expends federal funds, the District reserves the right to immediately terminate any agreement in excess of $10,000 resulting from this procurement process in the event of a breach or default of the agreement by Vendor in the event Vendor fails to: (1) meet schedules, deadlines, and/or delivery dates within the time specified in the procurement solicitation, contract, and/or a purchase order; (2) make any payments owed; or (3) otherwise perform in accordance with the contract and/or the procurement solicitation. The District also reserves the right to terminate the contract immediately, with written notice to vendor, for convenience, if the District believes, in its sole discretion that it is in the best interest of the District to do so. Vendor will be compensated for work performed and accepted and goods accepted by the District as of the termination date if the contract is terminated for convenience of the District. Any award under this procurement process is not exclusive and the District reserves the right to purchase goods and services from other vendors when it is in the District's best interest.

(**C)** [*Applicable ONLY to federally assisted construction contracts.*] **Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."**

Pursuant to Federal Rule (C) above, when the District expends federal funds on any federally assisted construction contract, the equal opportunity clause is incorporated by reference herein.

(D) [*Applicable ONLY to prime construction contracts in excess of $2,000 where federal funds are being used for the project*] **Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of $2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.**

(E) [*Applicable ONLY to contracts in excess of $100,000 involving mechanics or laborers.*] **Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.**

Pursuant to Federal Rule (E) above, when the District expends federal funds, Vendor certifies that Vendor will be in compliance with all applicable provisions of the Contract Work Hours and Safety Standards Act during the term of an award for all contracts by the District resulting from this procurement process.

(F) Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of "funding agreement" under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

Pursuant to Federal Rule (F) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor agrees to comply with all applicable requirements as referenced in Federal Rule (F) above.

(G) [*Applicable ONLY to contracts in excess of $250,000.*] **Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of $250,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251- 1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).**

Pursuant to Federal Rule (G) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor agrees to comply with all applicable requirements as referenced in Federal Rule (G) above.

(H) 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 Federal Rule (H) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor 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.

(I) [*Applicable ONLY to contracts in excess of $100,000*] **Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.**

Pursuant to Federal Rule (I) above, when federal funds are expended by the District, Vendor certifies that during the term and after the awarded term of an award for all contracts by the District resulting from this procurement process, the vendor certifies that it is in compliance with all applicable provisions of the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352). The undersigned further certifies that:

(1) No Federal appropriated funds have been paid or will be paid for on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with the awarding of

a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement.

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

(3) The undersigned shall require that the language of this certification be included in the award documents for all covered sub-awards exceeding $100,000 in Federal funds at all appropriate tiers and that all subrecipients shall certify and disclose accordingly.

(J) Procurement of Recovered Materials – When federal funds are expended, the District and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include: (1) procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; (2) procuring solid waste management services in a manner that maximizes energy and resource recovery; and (3) establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

Pursuant to Federal Rule (J) above, when federal funds are expended by the District, as required by the Resource Conservation and Recovery Act of 1976 (42 U.S.C. § 6962(c)(3)(A)(i)), the vendor certifies, by signing this document, that the percentage of recovered materials content for EPA-designated items to be delivered or used in the performance of the contract will be at least the amount required by the applicable contract specifications or other contractual requirements.

(K) Domestic Preferences for Procurements – As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of 2 CFR Part 200.322, "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stag through the application of coatings, occurred in the United States. Moreover, for purposes of 2 CFR Part 200.322, "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum, plastics and polymer-based products such as polyvinyl chloride pipe, aggregates such as concrete, class, including optical fiber, and lumber.

Pursuant to Federal Rule (K) above, when federal funds are expended by the District, vendor certifies, by signing this document, that to the greatest extent practicable vendor will provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

(L) Ban on Foreign Telecommunications – Federal grant funds may not be used to purchase equipment, services, or systems that use "covered telecommunications" equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. "Covered telecommunications" means purchases from Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities), and video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

Pursuant to Federal Rule (L) above, when federal funds are expended by the District, vendor certifies, by signing this document, vendor will not purchase equipment, services, or systems that use "covered telecommunications", as defined by 2 CFR §200.216, equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

RECORD RETENTION REQUIREMENTS FOR CONTRACTS INVOLVING FEDERAL FUNDS

When federal funds are expended by the District for any contract resulting from this procurement process, Vendor certifies that it will comply with the record retention requirements detailed in 2 CFR § 200.334. Vendor further certifies that it will retain all records as required by 2 CFR § 200.334 for a period of three years after grantees or subgrantees submit final expenditure reports or quarterly or annual financial reports, as applicable, and all other pending matters are closed.

CERTIFICATION OF COMPLIANCE WITH THE ENERGY POLICY AND CONSERVATION ACT

When the District expends federal funds for any contract resulting from this procurement process, Vendor certifies that it will comply with the mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6321 et seq.; 49 C.F.R. Part 18).

CERTIFICATION OF EQUAL EMPLOYMENT STATEMENT

It is the policy of the District not to discriminate on the basis of race, color, national origin, gender, limited English proficiency or handicapping conditions in its programs. Vendor agrees not to discriminate against any employee or applicant for employment to be employed in the performance of this Contract, with respect to hire, tenure, terms, conditions and privileges of employment, or a matter directly or indirectly related to employment, because of age (except where based on a bona fide occupational qualification), sex (except where based on a bona fide occupational qualification) or race, color, religion, national origin, or ancestry. Vendor further agrees that every subcontract entered into for the performance of this Contract shall contain a provision requiring non-discrimination in employment herein specified, binding upon each subcontractor. Breach of this covenant may be regarded as a material breach of the Contract.

CERTIFICATION OF COMPLIANCE WITH BUY AMERICA PROVISIONS

[*Only Applicable to Contracts funded under the National School Lunch Program*] The Buy American regulations promulgated by USDA and TDA require public school districts to purchase domestically grown and processed food to the maximum extent practicable. The food product must consist of agricultural commodities that were grown domestically, unless an authorized exception exists and has been approved by the District.

CERTIFICATION OF ACCESS TO RECORDS – 2 C.F.R. § 200.336

Vendor agrees that the District's Inspector General or any of their duly authorized representatives shall have access to any books, documents, papers and records of Vendor that are directly pertinent to Vendor's discharge of its obligations under the Contract for the purpose of making audits, examinations, excerpts, and transcriptions. The right also includes timely and reasonable access to Vendor's personnel for the purpose of interview and discussion relating to such documents.

CERTIFICATION OF APPLICABILITY TO SUBCONTRACTRS

Vendor agrees that all contracts it awards pursuant to the Contract shall be bound by the foregoing terms and conditions.

VENDOR AGREES TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, RULES, REGULATIONS, AND ORDINANCES. IT IS FURTHER ACKNOWLEDGED THAT VENDOR CERTIFIES COMPLIANCE WITH ALL PROVISIONS, LAWS, ACTS, REGULATIONS, ETC. AS SPECIFICALLY NOTED ABOVE.

Vendor's Name: _____

Address, City, State, and Zip Code: _____

Phone Number: _____ Fax Number: _____

Printed Name and Title of Authorized Representative: _____

Email Address: _____

Signature of Authorized Representative: _____

Date: _____

CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION

THIS FORM MUST BE COMPLETED BY ALL SERVICE PROVIDERS

Section 1

Vendor (Name): _____

Contract Dates: _____ Drivers License Number: _____ Date of Birth: _____

No _____ Will employees, including you have continuing duties related to the proposal or contract named above or any other services performed at GPISD?

Until further guidance is received, GPISD considers "continuing duties" to mean repetitive work duties rather than a onetime appearance or engagement.

No _____ Will those employees, including yourself, have direct contact with students?

Direct contact with students is contact that results from activities that provide substantial opportunity for verbal or physical interaction with students and that is not supervised by a certified educator or other professional district employee. Examples include unsupervised coaching, tutoring, or other services to students. 19 Tex. Admin. Code § 153.1101(7).

If either question is answered "no" vendor should complete section 2 of this form.

If answer to both questions is "yes" vendor should complete section 3 of this form.

Section 2

I agree and understand employees of the company or individuals, including myself, who have not received the required criminal background check because the above description does not apply to them/myself will be considered visitors when on school campuses and must follow school district and campus policies related to visitors on school campuses.

_____ _____ _____

Signature of Vendor Print Name Date

Section 3

As a result of revised DPS procedures related to access to national criminal history record information, only NCPA qualified school district contractors have access to national criminal history record information. Accordingly, non-NCPA qualified contractors must cooperate with the school district in facilitating criminal history reviews when the school performs the DPS FACT Clearinghouse review of criminal history record information in place of the school contractor. Accordingly, contractors must certify one of the following, depending on whether contractor is NCPA-qualified.

☐ **NCPA Qualified**: The undersigned certifies that all employees, including myself, of the company that I own, operate, or manage, or myself as an independent contractor who have continuing duties related to the service to be performed on a GPISD campus and who also have direct contact with students have undergone the required criminal history background check or national criminal history record information review which may include fingerprints and photographs and that no prohibited contact as described herein was revealed.

OR

☐ **Non-NCPA Qualified**: The undersigned certifies that I have ensured that all employees, including myself, of the company that I own, operate, or manage, or myself as an independent contractor who have continuing duties related to the service to be performed on a GPISD campus and who also have direct contact with students have cooperated with GPISD in submitting all information necessary for GPISD to utilize its LEE Fast Pass procedure to perform the required criminal history background check or national criminal history record information review which may include fingerprints and photographs.

_____ _____ _____

Signature of Vendor Print Name Date

INSTRUCTIONS FOR COMPLETING PRE-EMPLOYMENT OR PRE-SERVICE AFFIDAVIT FOR EDUCATIONAL ENTITIES

Pursuant to Texas Education Code §22A.055, as enacted by SB 571 (89th Legislature, 2025), all individuals who are applying for employment with or who will act as a service provider for an educational entity must complete the attached Pre-Employment or Pre-Service Affidavit for Educational Entities prior to providing services. Completed affidavits should be returned to [Purchasing Department] at [purchasing@galenaparkisd.com].

Please note the following requirements:

1. **Who Must Complete the Affidavit**

   Every employee of contractor, and every employee of any subcontractor, who will be present at an instructional campus to provide services must complete this affidavit before services begin.

2. **Definition of "Service Provider"**

   Under Texas Education Code §22A.001(8), "service provider" means a person who provides services to an educational entity. The term includes:
   - a contractor or subcontractor for an educational entity;
   - a provider of tutoring services;
   - an entity that contracts to operate a district campus under Texas Education Code §11.174;
   - a staffing provider for an educational entity; and
   - a person employed by or under the control of any of the above.

3. **Use of the Affidavit**

   This affidavit must be signed, dated, and returned for each qualifying employee before they are permitted to provide services on campus.

   The affidavit must be accurate and complete. Failure to disclose required information will result in termination of service and constitutes a **Class B misdemeanor** under Texas law.

4. **Ongoing Compliance**

   You have a continuing duty to promptly report to the District any updates or changes to the information disclosed in the attached affidavit.

PRE-EMPLOYMENT OR PRE-SERVICE AFFIDAVIT FOR EDUCATIONAL ENTITIES

Pursuant to Texas Education Code (TEC) §22A.055, a person applying for employment with or who will act as a service provider for an educational entity (school district, district of innovation, open-enrollment charter school, other charter entity, regional education service center, or shared services arrangement) ***must*** *submit, using a form adopted by the agency, a pre-employment or pre-service affidavit.*

Section 1 - Penalties for Failure to Disclose Required Information

A person commits an offense, a Class B misdemeanor, if the person fails to disclose information required to be disclosed under TEC §22A.055. Additionally, a determination that an employee or person providing services failed to disclose information required to be disclosed by a person under TEC §22A.055 is grounds for termination of employment or service.

Section 2 – Disclosure of Work History and Consent for Release of Records

Have you previously been employed by or acted as a service provider, or are you currently employed by or currently acting as a service provider for a public or private school?	Yes ☐ No ☐
Do you consent for release of your prior employment records? *Pursuant to TEC §22A.055, a person applying for employment with or who will act as a service provider for an educational entity must consent for release of the person's employment records.*	Yes ☐ No ☐

Section 3 – Disclosure of Investigation or Placement on the Do Not Hire Registry

Have you ever been terminated, non-renewed, or discharged from a public or private school?	Yes ☐ No ☐
Have you ever resigned, in lieu of being terminated or discharged, from a public or private school?	Yes ☐ No ☐

Have you ever been investigated by a law enforcement or child protective services agency for, or charged with, adjudicated for, or convicted of, an offense involving the following conduct described by TEC §22A.051(a)(2)(A), (B), (C), or (D) ?: • abused or otherwise committed an unlawful act with a student or minor, including by engaging in conduct that involves physical mistreatment or constitutes a threat of violence to a student or minor and that is not justified under Chapter 9, Penal Code, regardless of whether the conduct resulted in bodily injury; • was involved in or solicited a romantic relationship with or solicited or engaged in sexual contact with a student or minor; • engaged in inappropriate communications with a student or minor, as defined by board rule; • failed to maintain appropriate boundaries with a student or minor, as defined by board rule; *Adjudication and conviction refer to a conviction, plea of guilty or no contest (nolo contendre), probation, suspension, or deferred adjudication.* *Charge refers to a formal criminal charge as documented by a primary charging instrument (a complaint, information, or indictment) under the Texas Code of Criminal Procedure.*	Yes ☐ No ☐
Have you ever been investigated by a licensing authority or had a license, certificate, or permit denied, suspended, revoked, or subject to another sanction in this state or another state for conduct described by TEC §22A.051(a)(2)(A), (B), (C), or (D), which is described above?	Yes ☐ No ☐
Are you now the subject of an inquiry, disciplinary action, review, or investigation, by any public or private school, by a teacher-licensing agency, by any law enforcement agency, or in the court of Texas or any other state in connection with any alleged misconduct?	Yes ☐ No ☐
Have you ever been listed on the Do Not Hire Registry under TEC §22A.151 by the Texas Education Agency.	Yes ☐ No ☐
If you answered YES to any question in this section, disclose all relevant facts known to you pertaining to the matter, including, if applicable to the action, whether the allegation was determined to be true or false.	

Section 3 – Declaration of Applicant

Name (First, Middle, Last)	Date of Birth
Address (House/Unit # and Street Name)	
Address (City, State, Zip Code)	County
Signature	Date Signed

ADDENDUM TO AGREEMENT

This Addendum is entered into by and between Galena Park Independent School District ("District") and the Vendor/Contractor named below and is incorporated into the Agreement between the parties. The purpose of this Addendum is to ensure compliance with recent legislative updates enacted by the Texas Legislature.

1. Certification Regarding Prohibition on Diversity, Equity, and Inclusion Duties

Pursuant to Section 11.005(b)(2), Texas Education Code, the Vendor/Contractor hereby certifies that it shall not engage in, and shall prohibit any of its employees, agents, or subcontractors from engaging in, diversity, equity, and inclusion ("DEI") duties (as defined by Section 11.005(a)(1)-(4) of the Texas Education Code) at, for, or on behalf of the District, except as required by state or federal law.

2. Conflict of Interest Certification

Pursuant to Section 11.067, Texas Education Code, the Vendor/Contractor certifies that no member of the District's board of trustees, nor any individual related to a board member within the second degree by consanguinity or affinity, has a substantial interest (as defined by 11.067(c)(1)(-2) of the Texas Education Code) in the Vendor/Contractor or any subcontractor hired by the Vendor/Contractor, and that no board member has received or been promised gifts or in-kind services valued at more than $250 from the Vendor/Contractor. Vendor/Contractor further certifies that it will not engage in any activity prohibited by Section 11.067 during the term of this Agreement.

3. Acknowledgement of Pre-Employment/Pre-Service Affidavit for Service Providers

Pursuant to Texas Education Code §22A.001(8), a "Service Provider" is defined as a person who provides services to an educational entity, including a contractor or subcontractor of an educational entity; a provider of tutoring services; an entity that contracts to operate a district campus under §11.174; a staffing provider for an educational entity; and person employed by or under the control of any of the aforementioned contractors, subcontractors, providers, and entities ("Service Provider"). By entering into this Agreement, Vendor/Contractor acknowledges that all Service Providers must complete and return the Pre-Employment/Pre-Service Affidavit in the form adopted by the Texas Education Agency ("Affidavit") prior to delivering services. Vendor/Contractor further acknowledges and agrees that it has a continuing duty throughout the term of this Agreement to ensure that the information provided in each affidavit remains accurate. Vendor/Contractor shall ensure that all employees and subcontractors promptly update and provide to the District any revised Affidavit or supplemental disclosure if circumstances change such that the information previously

provided is no longer complete or accurate. Vendor/Contractor shall ensure that any new employees or subcontractors engaged after commencement of services complete and return the Affidavit before providing services. Service Providers who fail to comply with these requirements are subject to termination and are prohibited from providing services to the District.

By signing below, Vendor/Contractor acknowledges and agrees that this Addendum is incorporated into and made part of the Agreement between the District and the Vendor/Contractor.

Vendor/Contractor Signature:_____
Name/Title:_____
Date: _____

GALENA PARK INDEPENDENT SCHOOL DISTRICT

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR BUILDING CONSTRUCTION CONTRACTS

GPISD Multi-Use Facility

1001

CSP # 25-603

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR BUILDING CONSTRUCTION CONTRACTS

Agreement made as of November 10, 2025, between the Board of Trustees of the Galena Park Independent School District, hereinafter called the Owner,

and the Contractor:	**[INSERT CONTRACTOR NAME]** **[INSERT CONTRACTOR ADDRESS]**
Project:	**GPISD Multi-Use Facility**
Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**
The Architect/Engineer is:	**VLK Architects** **20445 State Highway 249; Suite 350; Houston, Texas 77070**

The Contractor and the Owner for the consideration hereinafter named agree as follows:

ARTICLE 1. SCOPE OF WORK: The Contractor shall execute the entire Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others. The Contract Documents are listed below; these form the Contract and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract Documents, in order of priority, are:

This Agreement (Standard Form of Agreement Between Owner and Contractor, as may be amended by duly executed and authorized Change Orders)
Uniform General Conditions of the Contract for Construction – Consisting of 26 Pages, as modified by the:
Supplementary Conditions of the Contract for Construction – Consisting of 3 Page(s)
Special Conditions of the Contract for Construction – Consisting of 2 Page(s)
Project Manual per Attachment "A" – Consisting of ___Page(s)
Drawing List per Attachment "B" – Consisting of ___Page(s)
Addendum #1 – Dated _____ – Consisting of ___ Page(s)
Addendum #2 – Dated _____ – Consisting of ___ Page(s)
Addendum #3 – Dated _____ – Consisting of ___ Page(s)

Alternates: The following Alternates, fully described in the Contract Documents, are included as a part of this Contract:

(ACCEPTED ALTERNATES WILL BE LISTED HERE)

Unit Prices: The following Unit Prices, fully described in the Contract Documents, are included as a part of this Contract:

(UNIT PRICES WILL BE LISTED HERE)

ARTICLE 2. TIME OF COMPLETION: The Work to be performed under this Contract shall be commenced within ten (10) days from the date of the Notice to Proceed issued by the Owner; and the Contractor shall achieve Substantial Completion within the time stipulated in the Supplementary Conditions of the Contract, subject to

adjustments of this Contract Time as provided elsewhere in the Contract Documents. The time set forth for completion of the Work is an essential element of the Contract.
ARTICLE 3. THE CONTRACT SUM: The Owner shall pay the Contractor for performance of the Contract, subject to additions and deductions provided therein, the sum of

Base Bid	**$**
Alternate 1	
Alternate 2	
Owner's Contingency Allowance	**960,000**
	$

and make payments on account as provided elsewhere in the Contract Documents.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the day and year first written above.

ATTEST: (Notary Seal)

By:

_____
(notary signature)

_____
(notary name printed) (notary expiration date)

CONTRACTOR
[INSERT CONTRACTOR NAME] Inc.

By: _____
(original signature)

_____
(name and title printed)

BOARD OF TRUSTEES GALENA PARK INDEPENDENT SCHOOL DISTRICT

By:

_____
Signature

_____
Print Name

_____
Title

CERTIFICATE OF APPROVAL

I hereby certify that pursuant to procedures authorized by the Board of Trustees of the Galena Park Independent School District, the foregoing Agreement was approved the 10 day of November in the year 2025, and that the person whose signature appears above is authorized to execute such Agreement on behalf of the Board.

INSTRUCTIONS FOR PERFORMANCE AND PAYMENT BONDS

1. The name, including full legal name, and business or residence address of each individual party to the bond shall be inserted in the space provided therefore, and each such party shall sign the bond with his/her usual signature on the line opposite his/her seal.

2. If the Principals are partners, their individual names shall appear in the space provided therefore, with the recital that they are partners composing a firm, naming it, and all the members of the firm shall execute the bond as individuals and as co-partners.

3. If the Principal or Surety is a corporation, the name of the state in which incorporated shall be inserted in the space provided therefore, and said instrument shall be executed and attested under the corporate seal as indicated in the form. If the Corporation has no corporate seal, the fact shall be stated, in which case a scroll of adhesive seal shall appear following the corporate name.

4. The official character and authority of the person or persons executing the bond of the Principal, if a corporation, shall be certified by the Secretary or Assistant Secretary, according to the form herein provided. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the Secretary or Assistant Secretary, under the corporate seal, to be true copies.

THE DATE OF THE BOND MUST NOT BE PRIOR TO THE DATE OF THE STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR.

PERFORMANCE BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we,

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

as Principal, hereinafter called Contractor, and
(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the Galena Park Independent School District as Obligee, hereinafter called the Owner, in the amount of

_____ Dollars

($ _____),
for payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the principal has by written agreement dated the 10 day of November in the year 2025, entered into a contract with the Owner for

Project:	**GPISD Multi-Use Facility**
Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**

in accordance with the Contract Documents prepared by

The Architect/Engineer is:	**VLK Architects** **20445 State Highway 249; Suite 350; Houston, Texas 77070**

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW THEREFORE, the condition of this obligation is such that, if the Contractor shall faithfully perform the Contract in accordance with the Contract Documents, and shall fully indemnify and save harmless the Owner from all cost and damage which the Owner may suffer by reason of the Contractor's default or failure so to do and shall fully reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

In the event the Contractor is declared in default under the Contract, Surety will within Fifteen (15) days of the Owner's declaration of such default take over and assume completion of said Contract and become entitled to the payment of the balance of the Contract Sum. Conditioned upon the Surety's faithful performance of its obligations, the liability of the Surety for the Contractor's default shall not exceed the penalty of this bond.

The Surety agrees to pay to the Owner upon demand all loss and expense, including attorney's fee, incurred by the Owner by reason of or on account of any breech of this agreement by Surety.

Provided further, that if any legal action be filed upon this bond, venue shall lie in Harris County, State of Texas.

IN WITNESS WHEREOF, the above bonded parties have executed this instrument under their several seals this

_____ day of _____in the year 20 _____, the name and corporate seals of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

ATTEST: (Notary Seal)

By: _____
(notary signature)

_____
(notary name printed) (notary expiration date)

PRINCIPAL

By: _____
(original signature)

_____
(name and title printed)

SURETY'S

By: _____
(original signature)

_____
(name and title printed)

SURETY HOME OFFICE SERVICING AGENT

_____
(name)

_____
(title)

_____
(address)

_____

_____
(Telephone)

CERTIFICATION 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 that person's signature thereon to be genuine; and that said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

(CORPORATE SEAL)

PAYMENT BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

as Principal, hereinafter called Contractor, and(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the Galena Park Independent School District as Obligee, hereinafter called the Owner, in the amount of

_____ Dollars

($ _____),
for payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the principal has by written agreement dated the 13 day of May in the year 2024, entered into a contract with the Owner for

Project:	**GPISD Multi-Use Facility**
Address:	**353 North Castlegory; Houston, Texas 77049**
Project #:	**1001**

in accordance with the Contract Documents prepared by

The Architect/Engineer is:	**VLK Architects** **20445 State Highway 249; Suite 350; Houston, Texas 77070**

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.
NOW THEREFORE, the condition of this obligation is such that, if the Contractor shall promptly make payments to all claimants as defined in Chapter 2253 of the Texas Government Code as amended, of all persons supplying labor and materials in the prosecution of the work provided for in said Contract, then this obligation shall be null and void, but otherwise it shall remain in full force and effect. In the event Contractor fails to promptly pay when due persons who have supplied labor, materials, or supplies used in the performance of the said Contract, Surety will, upon receipt of notice from the Owner or a claim in the form required by law, satisfy all undisputed balances due, and make arrangements satisfactory to the interested parties to resolve all amounts disputed in good faith, but

in no event shall the liability of the Surety for the Contractor's failure to promptly pay for labor, materials, or supplies exceed the penalty of this bond.

The Surety agrees to pay to the Owner upon demand all loss and expense, including attorney's fee, incurred by the Owner by reason of or on account of any breech of this agreement by Surety.

Provided further, this bond is made and entered into for the protection of all claimants supplying labor and material in the prosecution of the work provided for in said Contract, and all such claimants shall have a direct right of action under the bond as provided in Chapter 2253 of the Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said chapter to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this

_____ day of _____in the year 20 _____, the name and corporate seals of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

ATTEST: (Notary Seal)

By: _____
(notary signature)

_____
(notary name printed) (notary expiration date)

PRINCIPAL

By: _____
(original signature)

_____
(name and title printed)

SURETY'S

By: _____
(original signature)

_____
(name and title printed)

SURETY HOME OFFICE SERVICING AGENT

_____
(name)

_____
(title)

_____
(address)

_____

_____
(Telephone)

CERTIFICATION AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____ secretary of the Corporation named as Principal within the Performance & Payment bond; that _____, who signed the said bond on behalf of the Principal, was then _____ of said corporation; that I know that person's signature thereon to be genuine; and that said bond was duly signed, sealed and attested for and in behalf of said Corporation by authority of its governing body.

(CORPORATE SEAL)

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

TABLE OF CONTENTS

ARTICLE 1 CONTRACT DEFINITIONS
1.1 Contract Documents
1.2 Owner
1.3 Architect/Engineer
1.4 Contractor
1.5 Subcontractor
1.6 Project
1.7 Work
1.8 Day
1.9 Contract Sum
1.10 Substantial Completion
1.11 Pre-Final Inspection
1.12 Final Inspection
1.13 Contract Time
1.14 The Drawings
1.15 The Specifications
1.16 The Project Manual
1.17 Sub-subcontractor

ARTICLE 2 LAWS GOVERNING CONSTRUCTION
2.1 Compliance with Laws
2.2 Wage Rates
2.3 State Sales and Use Taxes
2.4 Antitrust Claims

ARTICLE 3 CONTRACT DOCUMENTS AND BONDS
3.1 Copies Furnished
3.2 Ownership of Contract Documents
3.3 Contract Documents at the Site
3.4 Record Documents
3.5 Performance and Payment Bonds
3.6 Interrelation of Contract Documents
3.7 Tax ID Form

ARTICLE 4 CONTRACT ADMINISTRATION
4.1 General Administration
4.2 Subcontracts
4.3 Access to and Inspection of the Work
4.4 Separate Contracts
4.5 Contract Termination
4.6 Written Notice
4.7 Disputed Matters

ARTICLE 5 CONTRACT RESPONSIBILITIES
5.1 Owner's Responsibilities
5.2 Owner-Contractor Obligations
5.3 Contractor's Responsibilities

5.4 Contractor's Superintendent
5.5 Acts and Omissions
5.6 Conditions at Site or Building
5.7 Insurance
5.8 Safety Precautions and Emergencies
5.9 Materials and Workmanship
5.10 Tests
5.11 Removal of Defective Work
5.12 Royalties and Patents
5.13 Equivalent Materials
5.14 Technical Submittals
5.15 Cleaning

ARTICLE 6 CONTRACT CHANGES
6.1 Change Orders
6.2 Unit Prices
6.3 Claims for Additional Costs
6.4 Claims for Additional Time
6.5 Minor Changes
6.6 Bar to Claims
6.7 Administrative Procedures for Change Orders

ARTICLE 7 CONTRACT PAYMENTS
7.1 Schedule of Values
7.2 Progress Payments
7.3 Claims for Unpaid Labor and Materials

ARTICLE 8 CONTRACT COMPLETION TIME
8.1 Notice to Proceed
8.2 Construction Schedule
8.3 Delays and Extension of Time
8.4 Completion of Work
8.5 Failure to Complete Work on Time

ARTICLE 9 CONTRACT SUBSTANTIAL COMPLETION
9.1 Certification
9.2 Date of Substantial Completion
9.3 Additional Inspection Costs

ARTICLE 10 CONTRACT FINAL ACCEPTANCE AND PAYMENT
10.1 Notification
10.2 Final Payment Documentation
10.3 Final Payment

ARTICLE 11 CONTRACT CORRECTION PERIOD
11.1 One Year Contract Correction Period
11.2 Remedy of Defects Under Warranty

ARTICLE 12 OPERATION AND STORAGE AREAS
12.1 Contractor's Use of Premises
12.2 Contractor's Maintenance of Premises

ARTICLE 1

CONTRACT DEFINITIONS

Whenever the following terms are used in these General Conditions or in the other Contract Documents the intent and meaning shall be interpreted as follows:

1.1 Contract Documents: The Contract Documents consist of the Advertisement for Sealed Proposals, Instructions to Proposers, Proposal Security, Proposal Form, Felony Conviction Notice, Affidavit of Non-collusion, Certificate of Residency, fully executed Owner-Contractor Agreement, Performance Bond, Payment Bond, the Conditions of the Contract (General, Supplementary, Special and other Conditions), the Project Manual, the Drawings, Pre-Proposal Meeting Minutes, all Addenda issued prior to execution of the Contract, other documents listed in the Owner-Contractor Agreement, and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by the Owner and the Contractor, (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.

1.1.1 The Contract Documents form the Contract, which represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and the Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Architect or (4) between any person or entities other than the Owner and the Contractor.

1.1.2 The Contract Documents are complementary, and what is required by any one document shall be as binding as if required by all.

1.2 Owner: The Board of Trustees of the Galena Park Independent School District, who shall execute this Contract in the name of the School District, and who, along with certain designated administrative employees, shall be responsible for the administration of the Contract.

1.3 Architect/Engineer: An Architect registered in accordance with Occupation Code, Title 6, Chapter 1051 and/ or a professional Engineer, in accordance with Occupations Code 1001.057. Contract Documents by the Architect are limited in authority and responsibility as defined in the General Conditions.

1.4 Contractor: The individual, corporation, company, partnership, firm or other organization that has contracted to perform the Work under the Contract with the Owner.

1.5 Subcontractor: A person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. There shall be no direct contractual relationship between the Owner and any Subcontractor.

1.6 Project: All of the Work defined by the Contract Documents. 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 or by separate contractors.

1.7 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.

1.8 Day: A calendar day beginning and ending at 12:00 midnight, unless otherwise specifically stipulated.

1.9 Contract Sum: The total compensation payable to the Contractor for performing the Work as originally contracted for, or as subsequently adjusted by Change Order or other Contract Modification.

1.10 Substantial Completion: Jointly certified by the Architect/Engineer, Owner and Contractor as the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents, and approvals from regulatory agencies have been received, so that the Owner can occupy or utilize the Work or the designated portion thereof for its intended use. This includes a fully-operational HVAC system with controls, security system, fire alarm system and PA system.

1.11 Pre-Final Inspection: The inspection conducted to determine that a Project or a portion thereof, is substantially complete.

1.12 Final Inspection: The inspection conducted to determine that all deficiencies found in the Pre-Final Inspection, or subsequently discovered, have been corrected and that it is appropriate to release retainage and/or make final payment.

1.13 Contract Time: Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, from the Notice to Proceed to Substantial Completion.

1.14 The Drawings: The graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.15 The Specifications: 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.

1.16 The Project Manual: A volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.17 Sub-subcontractor: A person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site.

ARTICLE 2

LAWS GOVERNING CONSTRUCTION

2.1 Compliance with Laws: In the performance of the Work, the Contractor shall comply with all applicable State and Federal laws including, but not limited to, laws concerned with labor, equal employment opportunity, safety, criminal history review, and minimum wages. The Contractor shall become familiar with, and at all times shall comply with and give notices required by all Federal, State and Local laws, ordinances, rules, regulations and lawful orders of public authorities which in any manner affect the performance of the Work, and shall indemnify and save harmless the Owner and its official representatives against any claim arising from violation of any such law, ordinance or regulation by the Contractor or by the Contractor's Subcontractors or employees. When requested, competent evidence of compliance with applicable laws shall be furnished.

2.1.1 The Contractor shall cooperate with city or other governmental officials at all times where their jurisdiction prevails. The Contractor shall secure and pay for all permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when proposals are received or negotiations are concluded.

2.1.2 Where the Underwriters' Laboratories have established standards and issued labels for a particular group, class, or type of equipment the Underwriters' Laboratories label shall be required on all equipment in that category.

2.1.3 These Contract Documents shall be governed and interpreted in accordance with the laws of the State of Texas, and shall be performable in Harris County, Texas.

2.2 Wage Rates: The Contractor is required to pay not less than the wage scale of the various classes of labor as shown on the "Prevailing Wage Rate Schedule" in the Supplementary Conditions to the General Conditions of the Contract provided by the Owner. The specified wage rates are minimum rates only, and the Owner will not consider any claims for additional compensation made by any Contractor because of payment by the Contractor of any wage rates in excess of the applicable minimum rate contained in the Contract Documents.

2.2.1 Pursuant to the provisions of Chapter 2258 of the Texas Government Code, the Contractor shall forfeit as a penalty to the Galena Park Independent School District sixty dollars ($60.00) for each laborer, workman or mechanic employed, for each calendar day, or portion thereof, such laborer, workman or mechanic is paid less than the stipulated minimum rates for any Work done under the Contract by the Contractor or by a Subcontractor or Sub-subcontractor under the Contractor.

2.2.2 The Contractor is responsible for compliance with the prevailing wage laws in accordance with the Owner's Prevailing Wage Rate Schedule and associated Standard Job Classifications. The Owner reserves the right to conduct on-site interviews with construction workers in order to verify compliance.

2.2.3 All workers shall be classified in one of the job classifications in the Prevailing Wage Rate Schedule. The Contractor shall notify each worker commencing work on the Project of the worker's job classification and the established wage rate required to be paid. The notice must be delivered in writing to the employee, with copies to the Owner, and must list both monetary wages and fringe benefits to be paid for each classification in which the worker is assigned duties.

2.2.4 Competent evidence of compliance with the applicable laws and the Owner's Prevailing Wage Rate Schedule shall be furnished by the Contractor in the form of certified payroll reports submitted monthly in a form acceptable to the Owner.

2.2.5 The Contractor shall post the Prevailing Wage Rate Schedule at the Project construction site in a conspicuous location and maintain the posting throughout the construction period to ensure that all workers have access to wage rate information.

2.3 State Sales and Use Taxes: The Owner qualifies for exemption from state and local sales and use taxes pursuant to the provisions of the Texas Limited Sales, Excise and Use Tax Act (Taxation - General, Article 20.04, Vernon's Texas Civil Statutes). The Contractor shall claim exemption from payment of applicable State taxes by complying with such procedures as may be prescribed by the State Comptroller of Public Accounts. The Owner shall forward an executed copy of the GPISD Tax Exemption Certificate with the fully executed Owner/Contractor Agreement.

2.4 Antitrust Claims: The Contractor shall assign to the Owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Secs. 1 et seq (1973).

ARTICLE 3

CONTRACT DOCUMENTS AND BONDS

3.1 Copies Furnished: Drawings and the Project Manual: Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of the Drawings and the Project Manual as are reasonably necessary for execution of the Work.

3.2 Ownership of Contract Documents: All Contract Documents and copies thereof furnished by the Owner are and shall remain property of the Owner. In making copies of the Documents available the Owner does so only for the purpose of prosecution of the Work and does not confer a license or grant permission for any other use of the Documents. They are not to be used on any other Project and, with the exception of one Contract set for each party to the Contract, are to be returned to the Owner upon request following completion of the Work.

3.3 Contract Documents at the Site: The Contractor shall maintain in good order at the site one complete copy of all Contract Documents including Drawings, Project Manual, Addenda, Change Orders and other Contract Modifications, as well as a complete file of reviewed shop drawings and other technical submittals. The Contractor shall at all times give the Owner or its representatives and agents access thereto.

3.4 Record Documents: The Owner shall furnish to Contractor one set of "Xerox" Construction Drawings for the purpose of Record Documents. The Contractor shall maintain Record Documents and technical submittals (including shop drawings) which are marked to reflect the as-constructed conditions and representations of the Work performed, whether it be directed by Addendum, Change Order or other Contract Modifications. The as-constructed Record Documents and technical submittals shall also record accurately and dimensionally the locations of concealed elements of construction which are not specifically and dimensionally located in the original Contract Documents, particularly piping and equipment for utility, mechanical, electrical, plumbing and special systems. All records prescribed herein shall be made available for reference and examination by the Owner and its representatives and agents. The Contractor shall update the as-constructed Record Documents monthly prior to submission of periodic Applications for Payment. Failure to maintain such records shall constitute cause for denial of an Application for Payment otherwise due. Prior to the date of Substantial Completion, the Contractor shall deliver to the Architect/Engineer one complete set of as-constructed Record Documents which the Architect/Engineer shall review and (if found acceptable) shall then use in preparing final electronic Record Documents for the Owner.

The Contractor shall submit the Galena Park ISD Subcontractor Progress Assessment Form with each application for payment requesting payment be made for Work performed by a subcontractor that qualifies as a "small business" pursuant to GPISD Board Policy CV (Local). The Contractor shall also ensure that, once Contractor makes the applicable payment to the Small Business Subcontractor, the Subcontractor completes the Galena Park ISD Subcontractor(s)/Subcontractor(s) Supplier(s) Payment Certification Form in its entirety and Contractor agrees to submit the completed copies to Owner with the next application for payment. The completed Galena Park ISD Subcontractor(s)/Subcontractor(s) Supplier(s) Payment Certification Form must be received by the Owner before any further payment will be made to Contractor for any Work performed.

3.5 Performance and Payment Bonds: Performance and Payment Bonds are not required on contracts of less than $25,000.00. If the total Contract Sum equals or exceeds $25,000.00, then the Contractor shall execute (in accordance with the provisions of Section 2253.021 of the Government Code) the following bonds to the Owner: (1) Performance Bond in the amount of the total Contract Sum conditioned upon the faithful performance of the Contract. Said bond shall be solely for the protection of the Owner. (2) Payment Bond in the amount of the total Contract Sum solely for the protection of those supplying labor, materials and/or equipment in

the prosecution of the Contract. Additional requirements and instructions for preparation and submittal of Performance and Payment Bonds may be stipulated elsewhere in the Contract Documents.

3.5.1 Each bond shall be executed by a corporate surety or corporate sureties duly authorized to do business in the State of Texas, acceptable to the Owner, and on forms provided by the Owner. If any surety upon any bond furnished in connection with the Contract becomes insolvent, or otherwise not authorized to do business in this State, then the Contractor shall promptly furnish equivalent security to protect the interests of the Owner and of persons supplying labor, materials, and/or equipment in the prosecution of the Work contemplated by the Contract.

3.5.2 Each bond shall be accompanied by a valid Power-of-Attorney (issued by the surety company and attached, signed and sealed with the corporate embossed seal) authorizing the agent who signs the bond to commit the company to the terms of the bond, and stating (on the face of the Power-of-Attorney) the limit, if any, in the total amount for which the agent is empowered to issue a single bond.

3.6 Interrelation of Contract Documents: The interrelation of the Drawings and the Project Manual is as follows: The Project Manual establishes standards of design, quality, function and performance of several materials; the Drawings establish the locations, quantities, dimensions and details. Anything mentioned in the Project Manual and not shown on the Drawings, or shown on the Drawings and not mentioned in the Project Manual, shall be of like effect as if shown or mentioned on both.

3.6.1 Should the Drawings disagree one with another, or with the Project Manual, the better quality or greater quantity of Work or materials shall be performed or furnished. Figures and measurements given on larger scale drawings shall govern smaller scale drawings. In case of discrepancy either in the figures, in the Drawings, or in the Project Manual, the matter shall be promptly submitted in writing by the Contractor to the Architect/Engineer with a copy to the Owner. The Architect/Engineer shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at the Contractor's own risk and expense.

3.6.2 Any "Scope of Work" or "Work Included" statement placed in a Section of the Project Manual is intended to designate in general terms the types of Work to be performed. It is not intended to limit or to define the extent of the Work.

3.6.3 The location or grouping of Drawings and the placement of the Project Manual into Divisions and Sections is only for the convenience of referencing and relating like or similar types of Work. It is not intended to establish trade jurisdictions or to define or limit Work to be subcontracted. The prosecution and completion of all Work required by the Contract Documents is the responsibility of the Contractor.

3.7 Tax ID Form: Contractor shall provide to the Owner a copy of the executed notification of Tax ID Form W-9 prior to submitting the first Application for Payment.

ARTICLE 4

CONTRACT ADMINISTRATION

4.1 General Administration: Unless otherwise provided for in the Contract Documents, the Architect/Engineer will provide general administration of the Contract and will be the Owner's representative during construction and until final payment.

4.1.1 The Owner assumes no responsibility for any understanding given or representation made orally by its agents prior to the execution of this Contract, unless such understanding or representation is expressly stated in the Contract. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor. Any failure by the Contractor to become acquainted with available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the Work or mutually agreed changes thereto.

4.1.2 The Architect/Engineer has the authority to act on behalf of the Owner to the extent provided for in the Contract Documents, unless otherwise modified by written instrument which will be shown to the Contractor. The Architect/Engineer will advise and consult with the Owner.

4.1.3 The Owner's written instructions to the Contractor will generally be issued through the Architect/Engineer, except that the Owner reserves the right on appropriate occasions to issue instructions directly to the Contractor or through other designated representatives. All written communications concerned with the construction of the Project shall be furnished to the Owner, the Owner's designated agents and representatives, the Architect/Engineer, and the Contractor by the party originating the communication. All oral messages to or from the Contractor shall be given through the Owner's designated representative. The Contractor is responsible for complying with the Owner's administrative requirements set forth in these General

Conditions and stated elsewhere in the Contract Documents.

4.1.4 All oral instructions affecting Contract Sum, Contract Time or Contract interpretation, shall be confirmed promptly in writing with copies furnished to the Architect/Engineer, the Owner's designated representatives, and the Contractor by the party issuing the instruction.

4.1.5 No instructions affecting the Architect/Engineer's design liability shall be issued without the Architect/Engineer's prior written consent.

4.1.6 The Owner's representative, and the Architect/ Engineer with the Owner's consent, shall interpret the Contract requirements and have the authority to reject Work performed by the Contractor, which in the opinion of the Owner's representative or the Architect /Engineer does not meet the requirements of the Contract and to order such Work removed and replaced in accordance with paragraph 5. 11.

4.2 Subcontracts: The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms, conditions and requirements of the Contract Documents. Further, the Contractor shall fully inform all Subcontractors prior to executing an agreement with them that they will be required to perform their Work in conformance with the Contract Documents, and to submit cost estimates and change proposal requests in complete and full analytical detail per Paragraph 6.7.

4.2.1 The Contractor shall defend, indemnify and save harmless the Owner for any Subcontractor's claim which may result from the failure of the Contractor to incorporate the provisions of this Contract into any of the Contractor's subcontracts.

4.2.2 After the execution of the Contract, a change in any accepted Subcontractor or the addition of any new Subcontractor can only be made with the written consent of the Owner.

4.2.3 Re: Pre-Approved Sub-Contractors per the Supplementary Conditions.

4.3 Access to and Inspection of the Work: The Contractor shall provide sufficient, safe and proper facilities at all reasonable times for observation and/or inspection of the Work by authorized representatives of the Owner. The Architect/Engineer and the Owner will make periodic visits to the site to familiarize themselves with the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. The presence of the Owner or his representative at the Project site does not imply concurrence with or approval of the Work.

4.4 Separate Contracts: The Owner reserves the right to award other Contracts in connection with other portions of the Project under these or similar conditions of the Contract.

4.4.1 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 signs each separate Owner-Contractor Agreement. The Contractor for this Contract shall properly connect and coordinate the Work of this Contract with the Work of other Contractors. If any part of this Contractor's Work depends on proper execution or proper results on the Work of any other separate Contractor, this Contractor shall inspect and promptly report in writing to the Architect/Engineer any discrepancies or defects which the Contractor may find in such other Work that render it unsuitable for such proper execution or results. Failure of this Contractor to so inspect and report shall constitute an acceptance of the other Contractor's Work as fit and proper to receive the Work of this Contract, except as to defects which may develop in the other separate Contractor's Work after the execution of this Contractor's Work.

4.4.2 Should this Contractor cause delay or cause damage to the Work or property of any separate Contractor on the Project, this Contractor shall, upon due notice, endeavor to settle with such other Contractor by agreement. If such separate Contractor sues the Owner on account of any damage alleged to have been so sustained, then the Owner shall notify this Contractor who shall defend such proceedings and pay all costs in connection therewith and, if any judgment against the Owner arises there from, this Contractor shall pay or satisfy it.

4.4.3 This Contractor shall afford the Owner and/or other contractors reasonable opportunity for the introduction and storage of their materials and equipment, and for the execution of their Work, and for proper connection to and coordination with this Contractor's Work.

4.4.4 The Owner reserves the right to make essential installations which are pertinent to the use of the building or Project prior to Substantial Completion. Within this right the Owner may let other Contracts or may do such Work with its own labor forces and materials. The Contractor shall not commit or permit any act which will interfere with the performance of Work by any other Contractor or supplier, or by Owner's employees. The Contractor shall cooperate to the end that the Owner may

realize complete functioning of the building or Project on the day of Substantial Completion.

4.5 Contract Termination:

4.5.1 Termination by Contractor. If the Work is stopped for a period of ninety (90) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act of fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a Contract with the Contractor, then the Contractor may, upon ten (10) additional days written notice to the Owner and the Architect/Engineer, terminate the Contract and recover from the Owner payment for all Work executed and for any loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and overhead associated with such Work for losses and reasonable expenses resulting from such termination. If the cause of the Work stoppage is removed prior to the end of the ten (10) day notice period, the Contractor may not terminate the Contract.

4.5.2 Termination by Owner. If the Owner determines that the Contractor is adjudged as bankrupt, or if the Contractor makes a general assignment for the benefit of the Contractor's creditors, or if a receiver is appointed on account of the Contractor's insolvency, or if the Contractor persistently or repeatedly refuses or fails (except in cases for which extension of time is provided) to supply enough properly skilled workmen or proper materials, or if the Contractor persistently performs substandard Work, or persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or is otherwise guilty of a substantial violation of a provision of the Contract Documents, or fails to so prosecute the Work as to insure its completion (within the time, or any extension thereof, specified in this Contract), then the Owner may, without prejudice to any right or remedy, and after giving the Contractor and the Contractor's surety (if any) ten (10) days written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor. Should the surety fail to respond within fifteen (15) days following such notice and to pursue completion of the Work with diligence acceptable to the Owner, the Owner may arrange for completion of the Work and deduct the cost thereof from the unpaid balance of the Contract Sum, including the cost of additional Architect/Engineer services and Owner Contract administration costs made necessary by such default or neglect, in which event no further payment shall then be made by the Owner until all costs of completing the Work shall have been paid. If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the

Architect/Engineer's additional services made necessary thereby, then such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, then the Contractor or the Contractor's surety shall pay the difference to the Owner. If the Owner sues the Contractor or Surety on account of failure to pay such difference in cost upon demand, then the Contractor and Surety will pay all costs in connection therewith, including reasonable attorney's fees. This obligation for payment shall survive the termination of the Contract.

4.5.3 Termination for Convenience of Owner: Prior to or during the performance of the Work, the Owner reserves the right to terminate the Contract for convenience or unforeseen causes that may occur. Upon such occurrence, the following procedures will be adhered to:

4.5.3.1 The Owner will immediately notify the Architect/Engineer and the Contractor in writing, specifying the effective termination date of the Contract.

4.5.3.2 After receipt of the notice of termination, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due at that point in the Contract.

.1 Stop all Work.
.2 Place no further subcontracts or orders for materials or services.
.3 Terminate all existing subcontracts.
.4 Cancel all existing materials and equipment orders as applicable.
.5 Take all actions necessary to protect and preserve all property related to this Contract which is in the possession of the Contractor.

4.5.3.3 Within 180 days of the date of the notice of termination, the Contractor shall submit a final termination settlement proposal to the Owner based upon costs up to the date of termination, reasonable profit on Work done only, and reasonable demobilization costs. If the Contractor fails to submit the proposal within the time allowed, then the Owner may determine the settlement amount, and shall pay the determined amount to the Contractor.

4.5.3.4 If the Contractor and the Owner fail to agree on the settlement amount, then the matter will be handled as a dispute in accordance with the procedure described in Subparagraph 5.2.1.

4.6 Written Notice: Written notice shall be considered to have been duly given if delivered in person to the individual or member of the firm or to an officer of the corporation for whom it is intended, or if delivered to, or sent by registered or certified mail to, the last business address known to the one who gives the notice.

4.7 Disputed Matters: Disputed matters shall be handled through administrative procedures as established in Subparagraph 5.2.1.

ARTICLE 5

CONTRACT RESPONSIBILITIES

5.1 Owner's Responsibilities: The Owner shall furnish all surveys describing the physical characteristics, legal description and limitations, site utility locations and other information necessary to the Contractor which are under the Owner's control.

5.1.1 Communication with the Contractor shall be in accordance with Paragraph 4.1.

5.1.2 Necessary actions of the Owner, including processing of payments to the Contractor, shall be accomplished with reasonable promptness and subject to Government Code, Chapter 2251, Subchapter B.

5.2 Owner-Contractor Obligations: The Owner and the Contractor each bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys due, or to become due hereunder, without the previous written consent of the Owner.

5.2.1 Disputes: Except as otherwise provided in this Contract, any dispute concerning a question of fact arising under this Contract, which is not disposed of by the Owner-Contractor Agreement, shall be decided by the Owner (as represented by the Assistant Superintendent for Support Services) who shall reduce a decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Owner shall be final and conclusive unless, within 30 days from the date of receipt of such written decision, the Contractor mails or otherwise furnishes to the Owner a written appeal addressed to the Superintendent, Galena Park Independent School District. If the decision on the appeal is adverse, then the Contractor may, within 30 days from the receipt of such decision, make further appeal to the Board of Trustees of the Galena Park Independent School District whose decision shall be final and conclusive. In connection with any appeal under this Subparagraph, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of the Contractor's appeal to a person or persons appointed by the Board of Trustees for such purpose. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Owner's decision. Both parties agree that any decision of fact reached by the process in this Subparagraph 5.2.1 shall be contractually binding upon them and shall become a part of this Contract.

5.3 Contractor's Responsibilities: The Contractor shall supervise, coordinate and direct the Work using the Contractor's best skill and attention to assure that each element of the Work conforms to the requirements of the Contract Documents. The Contractor shall be solely responsible for and have control over all construction means, methods, techniques, safety, sequences and procedures, and for coordinating all portions of the Work under the Contract.

5.3.1 The Contractor is obligated to notify the Architect/Engineer, in writing, when 1) the Contractor is in disagreement with any items, details, methods, or specifications, or 2) if the Contractor has reason and can provide evidence that an element of the Work will not function properly or safely, or will not deliver appropriate service and durability if such item is provided in accordance with the Contract Documents. Such matters will be clarified in writing by the Architect/Engineer prior to their incorporation into the Project.

5.3.2 The Contractor's Superintendent shall prepare daily reports indicating all work in progress, listing all Subcontractors and crews working on site, and listing all material and equipment delivered to site. Provide copies of daily reports to Owner at progress meetings.

5.4 Contractor's Superintendent: The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the Project site from the Notice to Proceed to completion of all punch list items attached to the Certificate of Substantial Completion. The Superintendent shall not be a foreman working on the Project; shall be an individual satisfactory to the Owner; and shall not be changed without the written approval of the Owner (except if the Superintendent leaves the employment of the Contractor). The Superintendent shall represent the Contractor and shall have full authority to act on the Contractor's behalf. All communications given to the
Superintendent shall be as binding as if given to the Contractor.

5.5 Acts and Omissions: The Contractor shall be responsible for acts and omissions of the Contractor's employees, of the Contractor's Subcontractors, their agents and employees and of other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors. . The Owner may, in writing, require the Contractor to remove from the Work any employee that the Owner's designated representative or agent finds careless, incompetent or otherwise objectionable.

5.6 Conditions at Site or Building: The Owner makes no representations as to the accuracy or completeness of the site information furnished to the Contractor by Owner; does not expressly or impliedly warrant same; and is not responsible for any interpretations or conclusions reached by the Contractor with respect thereto. It is the Contractor's sole responsibility to verify (to the Contractor's own satisfaction) all site information including, but not restricted to, topographical data, borings, subsurface information, utilities and easements.

5.6.1 The Contractor is responsible for having visited the site and having ascertained pertinent local conditions such as locations, accessibility, and general character of the site or building, the character and extent of existing Work within and adjacent to the site, and any other Work being performed thereon. Any failure to do so will not relieve the Contractor from responsibility for successfully performing the Work without additional expense to the Owner.

5.6.2 If, in the performance of the Contract, concealed, subsurface or latent conditions at the site are found to be materially different from the information included in the proposed Contract Documents; or if unknown conditions of an unusual nature are discovered which differ materially from the conditions usually inherent in Work of the character shown and specified, then the Architect/Engineer shall be notified in writing of such conditions before they are disturbed. Upon such notice, or upon the Architect/Engineer's own observation of such conditions, the Architect/Engineer, with the approval of the Owner, will promptly make such changes in the Contract Documents as the Architect/Engineer deems necessary to conform to the different conditions. Any increase or decrease in the cost of the Work or in the time within which the Work is to be completed,
resulting from such changes will be adjusted by Change Order, subject to the prior approval of the Owner.

5.7 Insurance

5.7.1 The Contractor shall not commence any portion of the Work under this Contract until the Contractor has obtained all the insurance required hereunder and Certificates of Insurance and Policy have been filed with and reviewed by the Owner. Acceptance of the insurance certificates by the Owner shall not relieve or decrease the liability of the Contractor.

.1 This section shall govern the entire Contract.

.2 The insurance shall contain a provision that at least thirty days prior written notice shall be given to the Owner in the event of cancellation, material change or non-renewal.

.3 Insurance shall be underwritten by a company rated not less than B + VII in Best's latest published guide.

.4 There shall be a hold harmless agreement in which the Contractor assumes liability on the Contract and holds the School District harmless.

.5 The Contractor shall purchase and maintain in force the following kinds of insurance and bonds for operations under construction contracts and as specified in each section.

5.7.2 Casualty Insurance - Unless otherwise provided for in the Supplementary Conditions, the Contractor shall provide and maintain (until the Work covered in this Contract is completed and accepted by the Owner) the minimum insurance coverages as follows:

.1 Workmen's Compensation shall be furnished for all employees as follows:

A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a Project is required for the duration of the Project.

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.

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, Subcontractors, 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.

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.

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 401.011(44) for all employees of the Contractor providing services on the Project for the duration of the Project.

The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the Contract.

If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, then 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.

The Contractor shall obtain from each person providing services on a Project, and provide to the governmental entity:

1. A certificate of coverage, prior to that person beginning work on the Project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the Project; and
2. No later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

The Contractor shall retain all required certificates of coverage for the duration of the Project and for one year thereafter.

The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten 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.

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.

The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:

1. Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which 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;
2. 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;
3. 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.
4. Obtain from each other person with whom it contracts, and provide to the Contractor:
    a. A certificate of coverage, prior to the other person beginning work on the Project; and
    b. A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
5. Retain all required certificates of coverage on file for the duration of the Project and for one year thereafter;
6. Notify the governmental entity in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and
7. Contractually require each person with whom it contracts to perform as required by items 1-6, with the certificates of coverage to be provided to the person for whom they are providing services.

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.

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 days after receipt of notice of breach from the governmental entity.

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)

5.7.3 Commercial General Liability Insurance (Occurrence Basis Only)

5.7.3.1 The Owner shall be named additional insured on the Contractor's policy with waiver of subrogation as to the subject job.

5.7.3.2 Bodily injury and property damage:

1. Each Occurrence $1,000,000
2. General Aggregate $2,000,000
3. Products/Completed Operations
   a. Aggregate $1,000,000
4. Personal and Advertising Injury
   a. Occurrence $1,000,000
5. Fire Damage, Legal Liability
   a. Any One Fire $50,000
6. Medical Expenses
   a. Any One Person $5,000

5.7.4 Business (Commercial) Automobile Liability Insurance All Owned, Non-Owned, and Hired Coverage

1. Automobile Liability $l,000,000
2. The Owner shall be named additional insured on the Contractor's policy with waiver of subrogation as to the subject job.

5.7.5 Deletions and Exclusions

1. No deletions/exclusions from standard coverage forms shall be permitted, without the written consent of the Owner for Commercial General Liability Insurance or Business (Commercial) Automobile Liability Insurance.

5.7.6 Umbrella Liability Insurance

.1 Umbrella shall be issued as "Follow Form Policy".

.2 This policy shall provide coverage over the Workmen's Compensation, Commercial General Liability, and Business (Commercial) Automobile Liability (Covering All Owned, Non-Owned, and Hired Vehicles.)

5.7.7 Builder's Risk Insurance:

The Contractor shall obtain at the Contractor's expense, All Risk Property Insurance coverage, acceptable to the Owner, in the amount of insurance equal at all times to the insurable value of materials delivered and labor performed. The policy so issued in the name of the Contractor shall also name all Subcontractors and the Owner as additional insured, as their respective interests may appear. The policy shall have endorsements as follows: "This insurance shall be specific as to coverage and not considered as contributing insurance with any permanent insurance maintained on the present premises."

.1 The policy shall be written in the name of the Owner and Contractor as their interest may appear.
.2 The policy shall be written on all risk basis for physical loss or damage and include the vandalism, malicious mischief.
.3 The amount of coverage shall be for the full insurable value of Work.
.4 The deductible shall not be over $1,000.00 without approval of the Owner. (Deductible losses shall be paid by the Contractor.)
.5 The policy shall include an endorsement allowing Owner occupancy, and the insurance shall not be canceled or altered on account of partial occupancy prior to completion.
.6 The original Builder's Risk Policy shall be furnished to the Owner prior to start of the job. This shall be a "Stand Alone" Policy.
.7 The Policy shall include $500,000 extra expense.

5.8 Safety Precautions and Emergencies:

5.8.1 It shall be the duty and responsibility of the Contractor and all of its Subcontractors to be familiar and comply with all requirements of Public Law 91-596 enacted by Congress, December 29, 1970, cited as the Occupational Safety and Health Act of 1970, and all amendments thereto, commonly referred to as OSHA, and to enforce and comply with all of the provisions of this

Act. The Owner reserves the right to enforce standard safety practices through the Contractor, which shall take immediate action when notified either orally or written of an unsafe condition.

5.8.2 In any emergency affecting the safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor resulting from response to an emergency shall be considered in accordance with Article 6 - Contract Changes.

5.9 Materials and Workmanship: All Work shall be executed in accordance with the Contract Documents, complete in all parts and in accordance with approved practices and customs, and of the best finish and workmanship. Unless otherwise specified, all materials and equipment incorporated in the Work under the Contract shall be new.

5.10 Tests: If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the Contractor shall give the Owner and the Architect/Engineer timely notice of its readiness and of the date arranged so that the Architect/Engineer may observe such inspection, testing or approval.

5.10.1 The Owner shall pay for all routine testing of materials agreed by the Architect/Engineer and the Owner to be required by the Contract Documents or to be in the best interests of the Owner. When retesting of material failing the initial test is required, the cost of retesting will be paid for by the Contractor. Any special testing which is specifically required in the scope of Work and specifically stipulated to be the responsibility of the Contractor in a technical section of the Project Manual shall be paid for by the Contractor.

5.10.2 Should testing of suspected non-compliant material or Work require that completed Work be removed to accomplish the testing, and further should the testing demonstrate that the material or Work fails to comply with the requirements of the Contract Documents, the Contractor shall bear all costs of the testing, inspection or approval as well as the cost of replacement of unsatisfactory material or Work as provided by paragraph 5.11. Should the testing demonstrate that the Work or material is in compliance, the Owner shall bear such costs and an appropriate Change Order shall be issued.

5.10.3 Material compliance with the Contract Documents shall be made by one of the following:

1. Manufacturer's certificate of compliance.
2. Mill certificate.
3. Testing laboratory certification.
4. Report of actual laboratory test from the Owner's laboratory or from a laboratory satisfactory to the Owner. Samples tested shall be selected by or in the presence of the Owner and the method of testing shall comply with the professional societies' standard specifications.

5.11 Removal of Defective Work: The Owner's representatives and the Architect/Engineer shall interpret the Contract requirements and shall be the final judge of the acceptability of the Work under the Contract Documents.

5.11.1 If any materials furnished under this Contract are judged to be not in compliance with requirements of the Contract Documents by the Owner and/or the Architect/Engineer, then the Owner and/or the Architect/Engineer will deliver to the Contractor a notification of such non-compliance in writing. The Contractor shall, after having received such written notice of non-compliance, proceed to remove from the grounds or buildings all materials (whether worked or unworked) and to take down all portions of the Work which the Owner and/or Architect/Engineer shall by such written notice condemn as unsound or improper or as in any way failing to conform to the requirements of the Contract Documents; and shall make good all Work damaged or destroyed thereby.

5.11.2 The Contractor shall, without charge, replace any material or correct any workmanship found by the Owner or Architect/Engineer not to conform to the requirements of the Contract Documents, unless in the public interest the Owner consents in writing to accept such material or workmanship with an appropriate adjustment in the Contract Sum. The Contractor shall promptly correct all Work rejected by the Owner or Architect/Engineer as defective or as failing to conform to the Contract Documents whether observed before or after the date of Substantial Completion or Final Inspection and acceptance and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work.

5.11.3 If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Owner may, 1) replace such materials or correct such workmanship and charge the cost thereof to the Contractor, or 2) terminate the Contractor's employment in accordance with Paragraph 4.5, Contract Termination.

5.11.4 If any portion of the Work is covered contrary to the instructions of the Owner or Architect/Engineer or to the requirements specifically expressed in the Contract

Documents, then it must be uncovered for observation or testing and recovered at the Contractor's expense without change in the Contract Time.

5.11.5 If any other portion of the Work is covered which the Owner or Architect/Engineer has not specifically requested to observe prior to being covered, then either may request to see such Work and it shall be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, then the cost of uncovering and recovering shall, by appropriate Change Order, be charged to the Owner. If such Work is found not to be in accordance with the Contract Documents, then the Contractor shall pay such costs.

5.12 Royalties Patents and Copyrights: The Contractor shall pay all royalties and license fees, and defend all suits or claims for infringement of any copyrights and patent rights; and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such royalties and license fees and loss when a particular design or process, or the product of a particular manufacturer or manufacturers is specified; provided, however, if the Contractor has reason to believe that the required design, process or product specified is an infringement of a copyright or a patent, then the Contractor shall be responsible for such royalties, license fees and loss unless the Contractor promptly gives information to the Owner and the Architect/Engineer.

5.13 Equivalent Materials: It is not the intent of these Contract Documents to limit materials to the product of any particular manufacturer. Where definite materials, equipment and/or fixtures have been specified by name, manufacturer or catalog number, it has been done to set a definite standard and a reference for comparison for quality, function, application, physical conformity, and other characteristics. It is not the intention to discriminate against or prevent any dealer, jobber or manufacturer from furnishing materials, equipment, and/or fixtures which meet or exceed the characteristics of the specified items as judged by the Owner and/or the Architect/Engineer. Substitution of materials shall not be made without prior written approval of the Owner and the Architect/Engineer.

5.13.1 The Contractor shall be responsible for any additional costs or delays resulting from having furnished materials, equipment or fixtures other than those specified or subsequently approved, and shall reimburse the Owner for any increased design costs resulting from such substitutions.

5.13.2 The Owner shall be the final judge of whether a proposed substitution meets or exceeds the characteristics of a specified item and decisions of the Owner relative to the equivalency of items proposed as substitutes for specified items shall be final and conclusive.

5.14 Technical Submittals:

5.14.1 Definition: Technical Submittals include Shop Drawings, Product Data, Installation Instructions, Samples, and other submittals which are typically related to construction materials, products, systems or services, and which are required by the Contract Documents.

5.14.1.1Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or any Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

5.14.1.2Product 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.

5.14.1.3Samples are physical examples furnished by the Contractor which illustrate materials, equipment or workmanship, and which establish standards by which the Work will be judged.

5.14.2 The Contractor shall submit within three (3) months after the date of the Notice to Proceed, and in orderly sequence, all Technical Submittals required by the Contract Documents, or subsequently required by the Architect/Engineer as covered by Contract modifications. The Contractor shall review them for compliance with Contract Documents and shall certify that the Contractor has done so by stamp, or otherwise, affixed to each copy thereof. Submittal data presented without such certification will be returned without review or other comment, and any delay resulting there from will be the Contractor's responsibility.

5.14.2.1The Contractor shall, within twenty (20) calendar days after receipt of the Notice to Proceed, submit to the Owner through the Architect/Engineer two (2) copies of a list of submittals, in a form acceptable to the Owner, which lists all Technical Submittals that are required by the Contract, and indicates which are to be reviewed and certified by the Contractor. The list shall then be reviewed and approved by the Owner and/or the Architect/Engineer.

5.14.2.1.1 The schedule shall include, but is not necessarily limited to, all Technical Submittals, certificates of compliance, material samples, material color charts or samples, guarantees, operation and

maintenance instructions, etc.

5.14.2.1.2 The schedule shall indicate the type of item, Contract requirements reference, the Contractor's scheduled dates for submitting the items, the projected need dates for approval from the Owner or the Architect/Engineer, and the projected or actual dates for procurement. The schedule shall show a minimum of fifteen (15) calendar days after receipt for review by the Owner and Architect/Engineer. If resubmittal is required, then an additional fifteen (15) days will be allowed for review after receipt. The Contractor will revise and/or update this schedule as appropriate, and submit same with each monthly Application for Payment.

5.14.2.1.3 The submittal schedule shall be coordinated with the Owner-reviewed, Contractor prepared and submitted construction schedule for all the Work. The Contractor shall revise and/or update the submittal schedule monthly to insure consistency with the construction schedule. The Owner shall be provided with two (2) copies of each revised submittal schedule.

5.14.3 Technical Submittals shall be properly identified, as specified or as the Owner and/or Architect/Engineer may require. At the time of submission, the Contractor shall inform the Owner and the Architect/Engineer in writing of any deviations in the Technical Submittals from the requirements of the Contract Documents.

5.14.4 By providing Technical Submittals, the Contractor thereby represents that the Contractor has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, or will do so; that the Contractor has checked and coordinated each Technical Submittal with the requirements of the Work and of the Contract Documents; and that the Contractor shall so certify as required by Subparagraph 5.14.2.

5.14.5 The Architect/Engineer and/or the Owner will review the Technical Submittals with reasonable promptness, but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The review of a separate item shall not indicate approval of an assembly in which the item functions. Review of the Technical Submittals shall not relieve the Contractor of responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has informed the Owner and the Architect/Engineer in writing of such deviations at the time of submittal and the Owner or the Architect/Engineer has not objected to the specific deviations. The approval shall not relieve the Contractor from responsibility for errors or omissions in the Technical Submittals.

5.14.6 The Contractor shall make any corrections required and shall resubmit the required number of corrected copies of the Shop Drawings or Product Data or new Samples of materials until accepted. The Contractor shall direct specific attention in writing to any new revisions other than the corrections requested on previous submissions.

5.14.7 No Work requiring a Technical Submittal shall be performed until the submittal has been reviewed. All such Work shall be in accordance with the reviewed Technical Submittal.

5.15 Cleaning: The Contractor shall at all times keep the premises and surrounding area clean and free from accumulation of waste materials or rubbish caused by the Work under this Contract. Upon completion of the Project, and prior to the Final Inspection, the Contractor shall have the premises in a neat and clean condition.

ARTICLE 6

CONTRACT CHANGES

6.1 Change Orders: A Change Order is a written order to the Contractor signed by the Owner, the Contractor and the Architect/Engineer, and issued after execution of the Contract which authorizes a change in the Work or an adjustment in the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in the Contract Sum or the Contract Time. It is recognized by the parties hereto and agreed by them that the Contract Documents may or may not be complete, or be free from errors, omissions and imperfections, or require changes or additions in order for the Work to be completed to the satisfaction of Owner. Accordingly, it is the express intention of the parties (notwithstanding any other provisions in this Contract) that any errors, omissions or imperfections in the Contract Documents, or any changes in or additions to same or to the Work ordered by Owner and any resulting delays in the Work or increases in Contractor's costs and expenses, shall not constitute or give rise to any claim, demand or cause of action of any nature whatsoever in favor of Contractor, whether for breach of Contract, quantum merit, or otherwise. However, the Owner shall be liable to the Contractor for the sum stated to be due the Contractor in any Change Order approved and signed by all parties. It is agreed hereby that such sum, together with any extension of time contained in said Change Order, shall constitute full compensation to the Contractor for all costs, expenses and damages to the Contractor, whether direct, consequential or otherwise in any wise

incident to, arising out of, or resulting directly or indirectly from the Work performed by the Contractor under such Change Order.

6.1.1 The Owner, without invalidating the Contract and without approval of the Surety, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order or Construction Change Directive and shall be performed under the applicable conditions of the Contract Documents.

6.1.1.1 Any other written order or oral order (which terms as used in this paragraph shall include direction, instruction, interpretation, or determination) from the Architect/Engineer or Owner shall be treated as a Change Order under this clause only if the Contractor gives the Owner written notice within twenty (20) days stating the date, circumstances, source of the order and that the Contractor regards the order to be a Change Order.

6.1.1.2 The Owner may, in writing, issue a Notice to Proceed for any portion of the Work in a Change Order for which final adjustment in Contract Sum and/or Contract Time has not been finalized. The Notice to Proceed letter may have a not-to-exceed cost amount for any or all portions of the Change Order. This amount is not to be exceeded without prior written approval by the Owner.

6.1.2 If the Contractor intends to assert a claim for an adjustment of cost or time over and above any adjustment already granted in a Change Order, then the Contractor must (within twenty (20) calendar days after receipt of a written Change Order, or receipt of oral or written order to proceed with a proposed change under Clause 6.1.1.2, or after the furnishing of a written notice under Clause 6.1.1.1) submit to the Owner a written statement setting forth in detail the nature and monetary extent of such claim as per Paragraph 6.3. The Contractor shall certify that the claim is made in good faith and that the supporting data is current, accurate and complete to the best of the Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Owner is liable. Failure to certify a claim will result in a determination that no claim has been filed. The thirty (30) day period of time for submission of such claim may be extended only by written agreement signed by the Owner. Except for claims based on defects in drawings or specifications furnished by the Owner, no claim for any change under Subparagraph
6.3.1 shall be allowed for any costs incurred more than twenty (20) days before the Contractor gives written notice as therein required; provided that, in the case of claims based on defects in drawings or specifications furnished by the Owner, the adjustment in cost shall include only those increased direct costs reasonably and necessarily incurred by the Contractor as a result of such defective drawings or specifications.

6.1.3 Except as provided above, no order, oral statement, or direction of the Owner or the Owner's duly appointed representative shall be treated as a change under this Article or entitle the Contractor to an adjustment thereunder.

6.1.4 The Contractor agrees that the Owner or any of its duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers, and records of the Contractor. Further, the Contractor agrees to include and submit evidence that all of its subcontracts include a provision to the effect that the Subcontractor agrees that the Owner or any of its duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers and records of such Subcontractor relating to any claim from the Contract, whether or not the Subcontractor is party to the claim. The period of access and examination described herein which relate to appeals under Subparagraph 5.2.1, litigation, or the settlement of claims arising out of the performance of this Contract shall continue until final disposition of such claims, appeals or litigation.

6.2 Unit Prices: If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the Owner or the Contractor, then the applicable unit prices shall be equitably adjusted as provided herein.

6.2.1 Each unit price proposed by the Contractor shall include all costs applicable to the Work including, but not limited to, mobilization, demobilization, labor, materials, equipment, supervision, delays, overhead at any level, and profit.

6.2.2 Either party may request an equitable adjustment. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred and fifteen percent (115%) or below eighty-five percent (85%) of the originally specified amount. If the quantity variation causes an increase in the time necessary for completion, then the Owner (upon receipt of a written request for an extension of time within thirty (30) days from the recognition of the variation or

within such further period of time as may be granted by written agreement signed by the Owner) will ascertain the facts and make such adjustment for changing the completion date as in its judgment the findings justify.

6.3 Claims for Additional Costs:

6.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum, then the Contractor shall give the Owner and the Architect/Engineer written notice thereof within thirty (30) days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Subparagraph 5.8.2. No such claim shall be valid unless so made and the Contractor hereby waives all claims for which such notice is not given. If the Owner and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by administrative procedures as provided in Subparagraph 5.2.1. Any changes in the Contract Sum resulting from such claim shall be authorized by Change Order.

6.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation of the Contract Documents, (2) any order by the Owner to stop the Work pursuant to Subparagraph 4.5.3 where the Contractor was not at fault, (3) any written order for a minor change in the Work issued pursuant to Paragraph 6.5, then the Contractor shall make such claim as provided in Subparagraph 6.3.1 in a timely manner which will not have an effect on the construction schedule.

6.3.3 Any claim shall contain the following elements: (1) an analysis of the relevant Contract provisions, (2) a description of the facts, (3) a statement of why the particular facts warrant compensation under the terms of the Contract, (4) supporting cost or pricing data per Paragraph 6.7, (5) legal analysis, if appropriate, (6) expert opinion, if appropriate, (7) certification per Subparagraph 6.3.4**,** and (8) a formal request for decision. All direct costs should be accurately presented in the claim, i.e., labor should come from payrolls, equipment from equipment reporting forms and materials should be based on invoices.

6.3.4 The Contractor shall certify that the claim is made in good faith, that the supporting data is current, accurate and complete to the best of the Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Owner is liable.

6.3.5 Failure to certify the claim will result in a determination that no claim has been filed.

6.4 Claims for Additional Time: If a change in the Work causes an increase or decrease in the Contract Time, then the Contractor's proposal shall include a reasonable estimate of such increase or decrease based on effects of the Change Order to critical path activities. Any costs associated with a change in the Contract Time is included in the fifteen percent (15%) mark-up.

6.5 Minor Changes: The Architect/Engineer, with concurrence of the Owner, will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time. Such changes shall be effected by written order which the Contractor shall carry out promptly.

6.6 Bar to Claims: No claim shall be allowed for an adjustment under this or any other provision of the Contract if asserted after final payment under this Contract.

6.7 Administrative Procedures for Change Orders: If a change in the Work will result in an increase or decrease in the Contract Sum, then the Owner shall have the right to require the performance thereof on a lump sum basis, a unit price basis or a time and material basis, all as hereinafter more particularly described (the right of the Owner as aforesaid shall apply with respect to each such change in the Work).

6.7.1 Lump Sum Proposal: In responding to a request for a proposed price for a change in the Work, or in submitting a claim, the Contractor shall furnish a lump sum proposal supported by a complete breakdown as described hereafter, indicating the estimated or actual cost to the Contractor for performance of the changed Work, including the applicable percentage of overhead and profit described hereafter. Any request for a time extension must be justified and presented in adequate detail to permit evaluation per Article 8, showing that the proposed change will delay the final Contract Completion Date.

6.7.1.1 A Lump Sum Proposal for the adjustment of Work shall contain the following items:

.1 Estimated cost, using any discount to the trades, of the materials and supplies used, which shall be itemized completely to include unit cost, quantity and total cost.

.2 The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub-subcontractors, may include reasonably anticipated direct wages of jobsite labor

(including foremen) who will be directly involved in the change in the Work (for such time as they will be so involved). In addition to the direct wages, payroll costs including Social Security, Federal/State Unemployment Insurance and like taxes may also be included. These payroll costs shall be itemized separately; and the Contractor shall provide verifying documentation of these costs. Furthermore, any fringe benefits required by applicable union/trade agreements in connection with such direct wages may also be included if the Contractor provides verifying documentation of these benefits.

.3 Estimated cost to the Contractor for additional construction equipment used solely on the Change Order, to include rental rates or owned equipment rates for such items of equipment while in use, which shall be itemized completely to include type(s), the number(s) of each, hourly rate, hours and total cost. Equipment which is regularly used at the job shall be used in Change Order Work at no extra charge. Rental or owned equipment rates shall be no greater than those established by the Association of General Contractors for the local area. As used herein the terms "construction equipment" and "equipment" shall include wheeled vehicles and small tools.

.4 Estimated transportation costs for delivery and handling of materials and supplies, bringing to and removing from the site additional construction equipment and/or new items of installed equipment, if applicable, which shall be itemized separately.

.5 Estimated off-site storage costs in excess of thirty (30) calendar days for new items of installed equipment, if applicable.

.6 To the Contractor's, Subcontractor's or Sub-subcontractor's cost proposal for Work performed by its own forces, a markup of fifteen percent (15%) shall be added to cover all elements of overhead and profit including, but not limited to, supervision above the level of foremen, estimating, scheduling, procurement, cleanup, temporary facilities, consumables, safety, quality control/assurance, protection, security, small tools, radios, company vehicles, home and branch office costs and expenses of any type whatsoever. To the Contractor's cost proposal five percent (5%) shall be added to the Subcontractor's or Sub-subcontractor's cost proposal to cover processing and management of the added Work. If any of the items included in the lump sum proposal are covered by unit prices contained in the Contract Documents, then the Owner may, if it requires the change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum proposal. In this event an appropriate deduction will be made in the lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.

.7 To the summary of the Contractor's proposed cost, the direct cost for insurance and bonds shall be added upon the Contractor providing documentation.

6.7.2. In cases where changes in the Work result in a credit to the Owner, the credit shall be limited to direct costs; that is, no overhead or profit shall be applied to such costs. In cases where a change in the Work results in both credits and charges to the Owner, the Contractor will be allowed to add the overhead and profit percentages indicated in Clause 6.7.1.1 to the net charge based upon the amount by which the total charges exceed the total credits; if there is a net credit, then no overhead or profit shall be charged.

6.7.3 Time and Material Proposal: If the Owner elects to have the change in the Work performed on a time and material basis, the same shall be performed, whether by the Contractor's forces or the forces of its Subcontractors or Sub-subcontractors, at actual cost to the entity performing the change in the Work plus the same markups for overhead and profit as set forth in Clause 6.7.1.1. The Contractor shall submit to the Owner daily time and material tickets which shall include the identification number assigned to the change in the Work, the classification of labor employed (and names and social security numbers), the materials used, the equipment rented (not tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all time and material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not constitute an acknowledgement by the Owner that the items thereon were reasonably required for the change in the Work.

6.7.4 Submission Time: Contractor's proposals for changes in the Contract Sum or Contract Time for Change Order Work shall be submitted within fourteen (14) calendar days of the Owner's or A/E's written request for same, unless the Owner or A/E extends such period of time due to the circumstances involved. If such proposals are not timely received, or if the changed Work should start immediately to avoid damage to the Project or to

avoid a delay, then the Owner may (at its discretion and in the interest of prosecuting the Work to timely completion) direct the Contractor to proceed with the changed Work. In this case the Owner shall direct the Contractor in writing to proceed with the Work on a time and material basis in compliance with Paragraph 6.7.3. This directive shall be known as a "PDL-NTE" (Price Determined Later - Not To Exceed). If such directive is given orally to the Contractor by the Owner under the above procedure, then the oral directive shall be confirmed in writing by the Contractor within seven (7) calendar days. The cost or credit and time adjustments will be determined through negotiation as soon as practicable thereafter and will be incorporated in a Change Order to the Contract. Prior to such negotiations, the Contractor shall keep separate costs on the "PDL-NTE" Work done up to that point.

6.7.5 Processing: The Owner will undertake to formally process Owner-Contractor agreed Change Orders with thirty (30) calendar days of agreement.

6.7.6 Construction Change Directive: If the Owner and the Contractor fail to agree on the terms of a Change Order, then the Owner shall issue through the Architect/Engineer a Construction Change Directive which is a written order directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum and/or Contract Time.

6.7.6.1 A Construction Change Directive may be issued before, during or after changed Work is accomplished, under the following conditions:

.1 The Contractor fails to submit a timely price and/or time extension proposal for the changed Work.

.2 Negotiation fails to achieve an agreed price and/or time extension, or there remains a disagreement concerning any part of the changed Work.

.3 Contractor fails or refuses to timely execute a Change Order by affixing the Contractor's signature thereto.

6.7.6.2 The terms of a Construction Change Directive including the change in Contract Sum and/or Contract Time shall be determined by the Owner with the assistance of the Architect/Engineer and shall, in the Owner's judgment, be fair and reasonable.

6.7.6.3 When a Construction Change Directive has been issued, it shall have the full force and effect of a Contract modification. It shall be included in schedules, Applications for Payment, reports and all official records of the Contract. The issuance of a Construction Change Directive will not prejudice any of the Contractor's rights to make claims or to appeal disputed matters under provisions of this Contract.

6.7.7 Notice to Proceed with Change Order Work: It is recognized that time is often of the essence in the execution of Change Order Work. Accordingly, the Owner may issue written notices to proceed with the Change Order Work while the formal Change Order is still being processed. The Contractor shall comply with these notices to proceed on the representation that formal confirming Change Orders will be issued.

ARTICLE 7

CONTRACT PAYMENTS

7.1 Schedule of Values: Upon execution of the Contract by the Owner and the Contractor, the Contractor shall submit for approval to the Owner and the Architect/Engineer a breakdown of the Contract Sum, itemizing material and labor for the various classifications of the Work. This Schedule of Values will be used as the basis for the Contractor's Applications for Payment.

7.1.1 No Application for Payment will be considered prior to receipt and approval of the Schedule of Values, which shall be in such detail as may be required by the Owner. The Schedule of Values shall be submitted to the Architect and Owner not less than twenty (20) days prior to the first Application for Payment, and this shall be a condition precedent to the processing of the first payment. The Schedule of Values shall follow the trade divisions of the Project Manual. Each item shall be assigned labor or material values, or both, with the subtotal thereof equaling the value of the Work in place when completed. Contractor's overhead and profit, mobilization, bond, and insurance shall each be listed as a separate line item on the Schedule of Values. The sum of all line items shall equal the Contract Sum.

7.1.2 The Contractor shall submit with the Schedule of Values a copy of all worksheets used in preparation of its proposal, supported by a notarized statement that the worksheets are true and complete copies of the documents used to prepare the proposal. The Contractor's proposal sheets shall be handled as confidential documents to the extent permitted by law.

7.2 Progress Payments: Payment will be made to the Contractor upon receipt of monthly Applications for Payment as provided hereinafter for the Work performed, and materials suitably stored and protected on the construction site. Progress payments do not constitute acceptance of Work not in accordance with the Contract Documents. Contractor shall provide a Department of the Treasury I.R.S. Form W-9 (latest edition) to the Owner prior to the first Application for Payment.

7.2.1 Once each calendar month, the Owner shall make a progress payment to the Contractor based upon an Application for Payment certified by the Architect/Engineer (for Work performed under this Contract during the preceding calendar month) which shall be accompanied by an affidavit that all payrolls, bills for labor, materials, equipment, or other indebtedness connected with such Work have been paid or will be paid within thirty (30) days after the Owner's receipt of the Application for Payment, or within the period of time required by Government Code, Chapter 2251, Subchapter B (see below), and a Certified Payroll (if specifically requested by Owner).

2251.021 Time for Payment by Governmental Entity.

a) Except as provided by Subsection b), a payment by a governmental entity under a Contract executed on or after September 1, 1987, is overdue on the 31st day after the later of:

1) the date the govern-mental entity receives the goods under the Contract;
2) the date the performance of the service under the Contract is completed; or
3) the date the govern-mental entity receives an invoice for the goods or services.

b) A payment under a Contract executed on or after September 1, 1993, owed by a political subdivision whose governing body meets only once a month or less frequently is overdue on the 46th day after the later event described by Subsections a)1) through 3).

c) For a Contract executed on or after July 1, 1986, and before September 1, 1987, a payment by a governmental entity under that Contract is overdue on the 46th day after the later event described by Subsections a)1) through 3).

Added by Acts 1993, 73rd Leg., ch. 268, 1, eff. Sept. 1, 1993. Amended by Acts 1995, 74th Leg., ch. 76, 5.42(a), eff. Sept. 1, 1995.

2251.022 Time for Payment by Vendor

a) A vendor who receives a payment from a governmental entity shall pay a Subcontractor the appropriate share of the payment not later than the 10th day after the date the vendor receives the payment.

b) The appropriate share is overdue on the 11th day after the date the vendor receives the payment.

Added by Acts 1993, 73rd Leg., ch. 268, 1, eff. Sept. 1, 1993.

2251.023 Time for Payment by Subcontractor

a) A Subcontractor who receives a payment from a vendor shall pay a person who supplies goods or a service for which the payment is made the appropriate share of the payment not later than the 10th day after the date the Subcontractor receives the payment.

b) The appropriate share is overdue on the 11th day after the date the Subcontractor receives the payment.

Added by Acts 1993, 73rd Leg., ch 268, 1, eff. Sept. 1, 1993.

7.2.2 To insure the proper performance of this Contract, the Owner shall retain not less than five percent (5%) of the amount of each Application for Payment until final completion and acceptance of all Work covered by this Contract. If the Owner, at any time after fifty percent (50%) of the Work has been completed, finds that satisfactory progress is being made, then the Owner may make any of the remaining progress payments in full; and provided further that, upon completion and acceptance of each separate building, or other division of the Contract on which the price is stated separately in the Contract, payment may be made in full including retained percentages thereon less authorized deductions. After Substantial Completion of the Work the Owner shall, upon application by the Contractor, approved by the Architect/Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Article 3, such payment may be made under the terms and conditions governing final payment, and shall not constitute a waiver of claims. Final payment shall be made after completion of the Work by the Contractor in accordance with the Contract Documents.

7.2.2.1 The provisions of Government Code 2251.021 through 2251.023 apply to payments under this Contract.

7.2.2.2 Any request for reduction or release of retainage

shall be accompanied by written consent of the Contractor's Surety to the request.

7.2.3 In preparing Applications for Payment all materials delivered and labor performed shall be included in the progress upon which payment is based. However, payment for materials will not be made prior to approval of materials for which submission of a Technical Submittal is required. Furthermore, payment for stored materials will be on the basis of provided invoices.

7.2.4 The Owner may withhold or, on account of subsequently discovered evidence, nullify that part of any Application for Payment to such extent as may be necessary to protect the Owner from loss on account of:

.1 Defective Work not remedied.
.2 Damage to Work of another Contractor.
.3 Failure to maintain scheduled progress.
.4 Receipt of written notice by the Owner of unpaid bills, as stipulated in Sec. 53.232, Texas Property Code, if the Contractor has not provided a payment bond and if the Contract Sum does not exceed $25,000.00. Any funds so withheld shall be released to the Contractor if the Contractor furnishes a bond for release of lien as provided in Sec. 53.236, Texas Property Code. When the above grounds are removed, payment will be made for amounts withheld because of them.
.5 Persistent failure to carry out the Work in accordance with the Contract Documents.
.6 Reasonable evidence that the Work will not be completed within the Contract Time.
.7 Reasonable evidence that the Work cannot be completed for the remainder of the Contract Sum.
.8 Assessment of fines for violations of Prevailing Wage Rate laws.

7.2.5 All material and Work covered by progress payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and Work upon which payments have been made or the restoration of any damaged Work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.

7.2.6 Payments to the Contractor shall not be construed to release the Contractor or the Contractor's Surety from any obligations under this Contract.

7.2.7 Upon the Owner's request, manifest proof of the status of Subcontractor accounts shall be furnished in a form acceptable to the Owner.

7.2.8 Applications for Payment must be signed by a corporate officer or a representative specifically named by the Contractor.

7.2.9 If the Owner so requires, then the Contractor in requesting payment for materials, shall provide copies of bills of lading, invoices, delivery receipts or other evidence of the location and value of such materials.

7.3 Claims for Unpaid Labor and Materials:

7.3.1 When the value of the Contract between the Owner and the Contractor is not in excess of $25,000.00, claimants are referred to Texas Property Code, Section 53.231, for requirements that are prerequisite to the filing of a valid lien on funds unpaid to the Contractor at the time of filing of the claim.

7.3.2 When the Contract between the Owner and the Contractor is in excess of $25,000.00, claims must be sent directly to the Contractor and the Contractor's Surety in accordance with Chapter 2253, Texas Government Code. The Owner will furnish, in accordance with such Article, a copy of the Payment Bond to claimants upon their request.

7.3.3 All claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or the Contractor's Surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such responsibility because of any representation by any agent or employee.

ARTICLE 8

CONTRACT COMPLETION TIME

8.1 Notice to Proceed: The Contract Time will begin on the date designated in the Notice to Proceed issued by the Owner after receipt of the fully executed Owner-Contractor Agreement, the Performance Bond, Payment Bond, and required insurance documentation. The Contractor is required to complete the Work in the time that is stated in the Supplementary Conditions of the Contract for Construction or any extension thereof. The Owner may delay the Work, or any part thereof, for any reason, in which case the time for completion of the Work will be extended by an equivalent amount of time.

8.2 Construction Schedule:

8.2.1 The Contractor is responsible for developing its own schedule logic with appropriate durations and manpower; however, all information must be acceptable and compatible with the Owner’s needs, and all target,

completion and milestone dates generated must be acceptable to the Owner. Within 14 days after the Notice to Proceed, the Contractor shall prepare and submit for approval by the Owner a detailed network construction schedule using precedence format with activity numbers based on a reasonable, rational system for identification purposes. Durations shall be in working days and appropriate to the activity. The Owner reserves the right to reject any schedule or report that fails to reflect timely completion of the Project, or any intermediate milestone, or otherwise indicates unrealistic performance. Failure of the Contractor to delivery satisfactory schedules or reports to Owner will result in temporary suspension of progress payments.

8.2.2 The detailed construction schedule submitted by the Contractor shall reflect complete sequence of construction by activity including:

.1 Submittal and shop drawing activities for procurement packages and equipment,
.2 Product procurement and delivery dates including long lead items,
.3 Contractual milestone dates,
.4 Dates for beginning and completion of each element of construction,
.5 Disruptions and shutdowns due to other operations, facilities and functions,
.6 Anticipated periods of overtime or shift work,
.7 Dates for installation and testing of all equipment,
.8 Cleanup,
.9 Contract startup and closeout.

8.2.3 On a weekly basis, the current detailed construction schedule shall be provided by the Contractor, who shall give a brief report describing activities begun or finished during the preceding week and a projection of all activities to be started or finished in the week to follow.

8.2.4 Each month the Contractor shall provide a revised detailed construction schedule consisting of bar chart summaries and (if requested by the Owner) revised network diagrams and tabular lists of activities plus certified data which:

.1 shows all changes occurring since the previous submission of the updated schedule,
.2 indicates progress of each activity and shows completion dates,
.3 includes:
  .1 major changes in scope and logic changes
  .2 activities modified since previous updating
  .3 identification of any slippage
  .4 revised projections due to changes
  .5 out-of-sequence progress
  .6 other identifiable changes

In the event that a revised detailed construction schedule is not acceptable to the Owner, then said schedule shall be revised by the Contractor until it is found acceptable by the Owner.

8.3 Delays and Extension of Time:

8.3.1 The Contractor may be granted a time extension by the Owner because of changes ordered in the Contract or because of strikes, lockouts, fire, unusual delay in transportation, unavoidable casualties, inclement weather in excess of normal, or any cause beyond the Contractor's control, which affected critical path activities. The Owner may extend the Contract Time subject to the following provisions.

8.3.2 Claims for time extensions must be made in writing within thirty (30) calendar days after the occurrence of the delay. All time extension claims shall be supported by comparing the original Construction Schedule with an updated Schedule indicating delays to critical path activities**.** In the case of a continuing cause of delay, only one claim is necessary. Claims for time extensions shall be stated in numbers of whole or half work days. In case of claims for time extension because of inclement weather in excess of normal, such time extension shall be granted only because such inclement weather prevented the execution of critical path activities of Work which delayed the final completion of the Contract. Resolution of delay claims shall be made at the Date of Substantial Completion.

8.3.2.1 The Owner's representative shall ascertain the facts and the extent of the delay and extend the Contract Time when (in the representative's judgment) the findings justify such an extension of Contract Time. The findings of the Owner's representative are final and conclusive on both parties and subject only to appeal as provided in Subparagraph 5.2.1.

8.3.2.2 The Contractor shall notify the Owner of delays to critical path items as they occur; and these delays shall be identified during the weekly progress meetings.

8.3.2.3 Time extensions granted for causes described herein will be granted on the basis of one Regular Work Day extension for each Regular Work Day lost (i.e., seven (7) calendar days extension will be granted after five (5) Regular Work Days are lost except as modified by the provisions contained herein related to Anticipated Inclement Weather days).

8.3.2.4 Each Proposer shall include Anticipated Inclement Weather Days in his proposed Contract Time as noted in the following schedule:

Number of Anticipated Inclement Weather Days to be Included in Proposed Contract Time (These are regular

work days)

January	-3	July	-4
February	-4	August	-4
March	-4	September	-4
April	-2	October	-3
May	-5	November	-5
June	-6	December	-4

8.3.2.5 Inclement Weather Days shall pertain to such items as rain, flooding, snow, unusually high winds, which prevent progress on major portions of the Work on regular work days only. If such situations occur on more than the Number of Anticipated Inclement Weather Days included in the Proposed Contract Time and if those additional days prevent the Contractor from performing critical portions of the scheduled Work, then time extensions caused by inclement weather may be requested as enumerated hereinafter. If the inclement weather is rain related, then the rain at the site must have been in excess of 0.50 inch in 24 hours.

8.3.2.6 At the beginning of each month the Contractor shall submit a schedule showing 1) the scheduled number of Anticipated Inclement Weather Days for the particular month, 2) the Actual Inclement Weather Days requested, and 3) the Net Inclement Weather Days (plus, minus, or no change). At times deemed appropriate by the Architect, the Contract Time will be adjusted by Change Order if the total of Net Inclement Weather Days is substantially greater than 0. If at the end of the Project all Anticipated Inclement Weather Days have not been used, then the Contract Time will not be reduced. An example of the monthly schedule to be submitted is as follows:

Month	Anticipated Inclement Weather Days(Regular)	Actual Inclement Weather Days (Regular) Requested	Net Inclement Weather Days(Regular)
January	3	8	5
February	4	0	-4
March	4	2	-2
April	2	2	0
May	5	7	2
June	6	10	4
TOTAL	24	29	5

Using this example, there were five (5) Net Inclement Weather Days (regular) for the first six (6) months of the Project and the extension of Contract Time would be seven (7) calendar days (since a seven (7) calendar days extension is granted after five (5) Regular Work Days are lost).

8.3.3 The Contractor shall have no claim for compensation or damages due to delays in, or hindrances to, the Work and further agrees that the Contractor shall be fully compensated for all delays solely by a time extension.

8.3.4 No time extension shall release the Contractor or the Surety furnishing a performance or payment bond from all obligations thereunder; which obligations shall remain in full force until the discharge of the Contract.

8.3.5 No time extensions will be allowed for any of the following conditions:

8.3.5.1 At least seven (7) hours of available work time out of the work day.

8.3.5.2 Saturdays, Sundays or Holidays unless the Contract requires and stipulates overtime work.

8.3.5.3 Time required for drying of materials when it is possible for the Contractor to enclose the area and use drying devices.

8.3.6 The Contractor shall maintain a Project log indicating all time in excess of one (1) hour for which work was suspended during a work day in order to obtain any time extension.

8.3.7 The Contractor shall obtain approval from the Owner for work during the following times:

8.3.7.1 Saturdays, Sundays or Holidays.

8.3.7.2 Prior to 7:00 am and after 7:00 pm on scheduled work days.

8.4 Completion of Work: The Contractor will be held to account for the Work being completed in the Contract Time, or any extension thereof.

8.4.1 If, in the judgment of the Owner, the Work is behind schedule and the rate of placement of Work is inadequate to regain scheduled progress so as to insure timely completion of the entire Work or a separable portion thereof, then the Contractor, when so informed by the Owner, shall immediately take action to increase the rate of Work placement. This increase shall be accomplished by any one or a combination of the following or other suitable measures:

.1 An increase in Work forces.
.2 An increase in equipment or tools.
.3 An increase in hours of work or number of shifts.
.4 Expediting delivery of materials.

8.4.2 The Contractor shall, within ten (10) calendar days after being so informed, notify the Owner of the specific measures taken and/or planned to increase the

rate of progress together with an estimate as to when scheduled progress will be regained. Should the plan of action be deemed inadequate by the Owner, the Contractor shall take additional steps or make adjustments as necessary to the plan of action until it meets with the Owner's approval. The increased rate of work will continue until scheduled progress is regained. Scheduled progress will be established from the latest revised and accepted progress schedule for the Project. Timely completion will be understood to be the Contract completion date as revised by all time extensions granted at the time acceleration is undertaken. The Contractor shall not be entitled to additional compensation for the additional effort applied to the Work under the terms of this Subparagraph.

8.5 Failure to Complete Work on Time: The time set forth in the Supplementary Conditions of the Contract for Construction for the completion of all Work is an essential element of the Contract. Contractor's failure to complete the Work within such time will cause damage to the Owner. The value of such damages shall be stated in the Supplementary Conditions of the Contract for Construction.

8.5.1 The time specified for completion in the Supplementary Conditions of the Contract for Construction shall cover final cleanup of the premises and completion of punch list deficiencies.

8.5.2 For each consecutive calendar day after the expiration of the Contract Time that any Work (including the correction of deficiencies found during the Final Inspection) is not completed and accepted, the amount per day as stipulated in the Supplementary Conditions of the Contract for Construction will be deducted from the money due or to become due the Contractor, not as a penalty but as liquidated damages and added expense for Contract supervision and Owner's delay costs in obtaining the use of the Work.

ARTICLE 9

CONTRACT SUBSTANTIAL COMPLETION

9.1 Certification: Should the Owner wish to use or occupy the Project, or part thereof, prior to final completion, and the Project, or a designated portion thereof acceptable to the Owner, is substantially complete, the Contractor shall prepare for and submit to the Architect/Engineer a comprehensive list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Owner and Architect/Engineer on the basis of a Pre-Final Inspection determine that the Project or designated portion thereof is substantially complete, the Architect/Engineer will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion; shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, operation of permanent equipment, damage to the Work, and insurance; and shall fix the time within which the Contractor shall complete all items on the list accompanying the Certificate.

9.1.1 Prior to the Pre-Final Inspection, and as a prerequisite to issuance of a Certificate of Substantial Completion, the Contractor shall furnish to the Owner all Record Documents, instructional manuals, maintenance manuals, parts catalogs, wiring diagrams, operational manuals, maintenance material stocks, spare parts and tools, specified written warranties, guarantees and like publications or parts for all installed equipment, systems and like items required by the Contract Documents; and shall conduct all instruction of the Owner's personnel required by the Contract Documents. If the Contractor does not furnish these requirements and the Owner must, out of necessity, obtain these materials, instructions, information and data, then the cost for this procurement will be deducted from the monies due the Contractor.

9.1.2 If the Owner must take occupancy of the Project due to compliance with State laws and the Project is not substantially complete, then the Contractor shall purchase extended warranties on equipment which must be in operation for the Owner to take occupancy.

9.2 Date of Substantial Completion: The Date of Substantial Completion of the Project, or designated portion thereof, is the date jointly certified by the Architect/Engineer, Owner and Contractor when construction is Substantially Complete as herein before defined.

9.3 Additional Inspection Costs: The Contractor shall be charged by the Owner for any costs of re-inspection resulting from substantial differences between the Contractor's list of items to be completed or corrected and the list of items resulting from the Pre-Final Inspection.

ARTICLE 10

CONTRACT FINAL ACCEPTANCE AND PAYMENT

10.1 Notification: When the Project is completed, the Contractor shall notify the Owner in writing that the Project will be ready for Final Inspection on a definite date. Upon verification by the Contractor that the Project

is ready for Final Inspection and acceptance, the Architect/Engineer and the Owner will within ten (10) calendar days make a Final Inspection and, when the Project is found acceptable under the Contract Documents and the Contract is fully performed, make final payment to the Contractor.

10.2 Final Payment Documentation: Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect/Engineer for transmittal to the Owner:

.1 Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706
.2 Contractor's Affidavit of Release of Liens, AIA Document G706A
.3 Contractor's, Subcontractor's, Sub-subcontractor's, and Supplier's separate releases on the prescribed forms.
.4 Consent of Surety to Final Payment, AIA Document G707 (if applicable).
.5 Final list of Subcontractors and Sub-subcontractors, AIA Document G805.
.6 The Contractor and each and every Subcontractor, Sub-subcontractor and Supplier shall provide a"Certificate of No Asbestos, PCB and Lead". *The form used shall be the attached form on Page 28 of these General Conditions.* For the purpose of definition as used in this form, the term "potable water systems" includes, but is not limited to, those water systems for drinking fountains, all sinks and lavatories, showers, bath tubs, residential and commercial kitchen equipment, icemakers, and hose bibbs, as applicable to this specific Project.
.7 Material Safety Data Sheets: Effective September 1, 2000, the Texas Department of Health implemented a new rule in the AHERA Regulation which requires that Material Safety Data Sheets be provided to the Owner by the Contractor on the materials incorporated into the Work which but not limited to the list below (not all of which may have been used in this specific Project):
  .1 Floor Tiles
  .2 Sheet Floorings
  .3 Adhesives (Mastics)
  .4 Suspended Ceiling Tiles
  .5 Glued-on/Nailed-on Ceiling Tiles
  .6 Gypsum Board
  .7 Blown-in Insulation
  .8 Batt/Roll Insulation
  .9 Gaskets
  .10 Sprayed-on/Troweled-on Surfacing Materials
  .11 Pipe Insulation
  .12 Pipe Fitting Insulation
  .13 Boiler Insulation
  .14 Flue Insulation (Vent Pipe Insulation)
  .15 Heating/AC Ducting
  .16 Air Handler Cloth Joint (Flex Joint)
  .17 Air Handler Insulation

If Material Safety Data Sheets are not provided by the Contractor, then the Contractor shall be responsible for obtaining samples of the materials listed above and the required testing of the samples at no additional cost to the Owner. These Material Safety Data Sheets shall be included in the maintenance and instruction manuals.

10.3 Final Payment:

10.3.1 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

.1 Faulty or defective Work appearing after Substantial Completion;
.2 Failure of the Work to comply with the requirements of the Contract Documents; or
.3 Terms of any special warranties required by the Contract Documents.

10.3.2 Acceptance of final payment shall constitute a waiver of all claims by the Contractor except those specifically enumerated at the time of final payment.

ARTICLE 11

CONTRACT CORRECTION PERIOD

11.1 One Year Contract Correction Period: Except as otherwise specified, the Contractor warrants and guarantees all Work against defects in materials, equipment or workmanship. For one (1) year from the date of Substantial Completion of the entire Project or designated portions thereof, the Contractor shall undertake correction, repair or replacement of any defective of non-conforming work.

11.2 Remedy of Defects Under Warranty: Upon receipt of written notice from the Owner of the discovery of any defects, the Contractor shall remedy the defects and replace any property damaged therefrom occurring within the contract correction period. If the Contractor, after notice, fails to proceed and remedy such defects within five (5) days or within any other period of time which has been agreed in writing, or to comply with the terms of the warranty and guarantee, then the Owner may have the defects corrected and the Contractor and the Contractor's Surety shall be liable for all expenses incurred. If the defect needs immediate correction, e.g., A/C system fails causing possible dismissal of school, then the Owner will contact the Contractor, Subcontractor, Sub-subcontractor, or manufacturer (whichever applies), advise them of the defect and make repairs. An itemized list of labor and materials with

certified payrolls and material invoices will be forwarded to the Contractor for payment.

ARTICLE 12

OPERATION AND STORAGE AREAS

12.1 Contractor's Use of Premises: The Contractor will operate and maintain operations areas and associated storage areas at the Project site in accordance with the following:

12.1.1 All Contractor operations, including storage of materials and employee parking upon the Project site, shall be confined to areas designated by the Owner.

12.1.2 The Contractor may erect temporary buildings at its expense, which shall remain its property. The Contractor shall remove such buildings and associated utilities service lines upon completion of the Project, unless the Contractor requests and the Owner provides written consent that it may abandon such buildings and utilities in place.

12.1.3 The Contractor will use only established roadways, or construct and use such temporary roadways as may be authorized by the Owner. Load limits of vehicles shall not exceed the limits prescribed by appropriate regulations or law. The Contractor will provide protection to existing and new road surfaces, curbs, sidewalks, trees, shrubbery, sprinkler systems, drainage structures and other like existing and new improvements to prevent damage. Any damage thereto shall be repaired by, and at the expense of, the Contractor.

12.1.4 The Owner may restrict the Contractor's entry to the Project site to specifically assigned entrances and routes.

12.2 Contractor's Maintenance of Premises: The Contractor shall at all times keep the Project site free from the accumulation of waste, waste materials, rubbish, or construction debris during performance of Work.

12.2.1 During the period of construction, and not less frequently than once a week, the Contractor shall remove from the Project site any and all waste materials, rubbish, construction debris and trash; and shall dispose of such waste materials, rubbish, construction debris and trash off the property of the Owner. The Contractor shall mow and trim the grass within the Project site at least every other week throughout the entire Contract Time.

Prior to the Contractor's requested date for a Pre-Final Inspection, the Contractor shall remove any and all remaining equipment from the Project site and shall leave the premises in a clean, neat and workmanlike condition satisfactory to the Owner.

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.

CC - SPECIAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The following are special conditions of the Galena Park Independent School District Contract for Construction.

SCHOOL SCHEDULE

The Owner currently plans the following school operations on or near the site of the Work during the Contract Time:

1. Full school operations will be conducted at the school during the normal school year. During the summer vacation, limited school operations will be conducted.
2. The Contractor shall not perform any work during the week of the STAAR and/or EOC testing. Refer to the attached schedule.
3. When school is in session, if the Contractor is going to work during time periods listed below, then the Contractor will include in its Base Proposal the cost of a GPISD employee at the rate of $50.00 per hour to operate the security system and provide access to the facility.
    a. Prior to 7:00 AM, after 11:00 PM.
    b. Weekends - refer to attached schedule.
    c. Holidays - refer to attached schedule
4. The Contractor shall recognize the critical need for safety of all persons involved in the school program, and the need to conduct construction operations in such a way as to minimize disruption of school program operation. Contractor understands that it is the obligation of the Contractor to protect the Work, materials and equipment from vandalism and theft, and that it cannot rely on school security personnel to perform this function.
5. Critical areas and systems including, but not limited to, air conditioning system, electrical system and kitchen must remain functional at all times while the school is in operation. Any renovation work that would require a shut down of these items must be accomplished during vacations, holidays, or at other times when the school is not operating.

CRIMINAL HISTORY

If Contractor does not have access to the criminal history records of employees who will work at the Sites, Contractor shall ensure such employees cooperate and submit all information necessary for District's LEE Fast Pass procedure.

CONSTRUCTION SCHEDULE

The new Galena Park ISD Multi-Use Facility and weight room portion of the project must be substantially completed by February 14, 2027, and completed prior to the commencement of the renovation work that is to be done to the existing Fieldhouse.

2025 | 26 SCHOOL CALENDAR

July 2025

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

August 2025

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

September 2025

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

October 2025

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November 2025

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

December 2025

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

January 2026

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February 2026

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

March 2026

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April 2026

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May 2026

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June 2026

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Important Dates

August 12 — First Day of School
May 22 — Last Day of School

New Teacher Orientation

July 29 - August 1

Student Holiday/Staff Development

August 4 - 11, 29
October 14
January 5
March 6
September 19
November 3, 4
February 13
April 2

Early Dismissal All Campuses

December 19
May 22

Holidays

July 4
October 10 - 13
Dec. 22 - Jan. 2
February 16
April 3 - 6
June 19
September 1
November 24 - 28
January 19
March 9 - 13
May 25

LEGEND

- Student Holiday/Staff Development
- District Holidays
- School Holidays, except for EOC Testing
- New Teacher Orientation
- Early Dismissal - All Campuses

SCHOOL HOURS

Elementary School	7:35 am - 3:15 pm
Middle School	8:20 am - 4:00 pm
High School	7:05 am - 2:45 pm
Early College High School	8:00 am - 4:15 pm
Zotz Education Center	8:15 am - 3:55 pm

Six Weeks Grading Period

High Schools

First Semester		Report Card Dates
1. Aug. 12 - Sept. 18	(26 days)	Sept. 26
2. Sept. 22 - Oct. 31	(27 days)	Nov. 7
3. Nov. 5 - Dec. 19	(28 days)	Jan. 9
Second Semester		
4. Jan. 6 - Feb. 12	(27 days)	Feb. 20
5. Feb. 17 - Apr. 1	(26 days)	Apr. 10
6. Apr. 7 - May 22	(34 days)	June 4

Nine Weeks Grading Period

Elementary/Middle Schools

First Semester		Report Card Dates
1. Aug. 12 - Oct. 9	(39 days)	Oct. 17
2. Oct. 15 - Dec. 19	(42 days)	Jan. 9
Second Semester		
3. Jan. 6 - Mar. 5	(40 days)	Mar. 20
4. Mar. 16 - May 22	(47 days)	May 26 ES/May 29 MS

State Testing Days

December 2 - 12	End of Course Testing
April 7 - April 24	STAAR/End of Course
May 4 - May 15	Dual Credit Finals/AP Testing
June 17 - 20	STAAR/End of Course Retest

(Subject to change if needed)

Galena Park Independent School District

14705 Woodforest Blvd. * Houston, Texas 77015 * 832-386-1000 * www.galenaparkisd.com

01/27/2025

DOCUMENT 00 31 32

GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 LOG OF BORINGS/CONTRACTOR RESPONSIBILITY

A. A copy of the locations and log of borings is bound herein.

B. Subsurface soil data derived from test borings are given only for the convenience of the Contractor, and neither the Owner nor the Architect assumes responsibility for the accuracy of or for the Contractor's interpretation of the data.

C. Contractor is responsible for any conclusions drawn from the boring data and is responsible for the work without extra compensation irrespective of whether or not the subsurface conditions encountered agree with the boring data.

1.2 REPORT

A. The full geotechnical report prepared by the Owner's independent geotechnical and testing laboratory is available in the Architect's office for inspection by the Contractor.

B. This geotechnical report is not a part of the Contract Documents.

END OF DOCUMENT

--- THIS PAGE INTENTIONALLY BLANK ---

Site Location



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

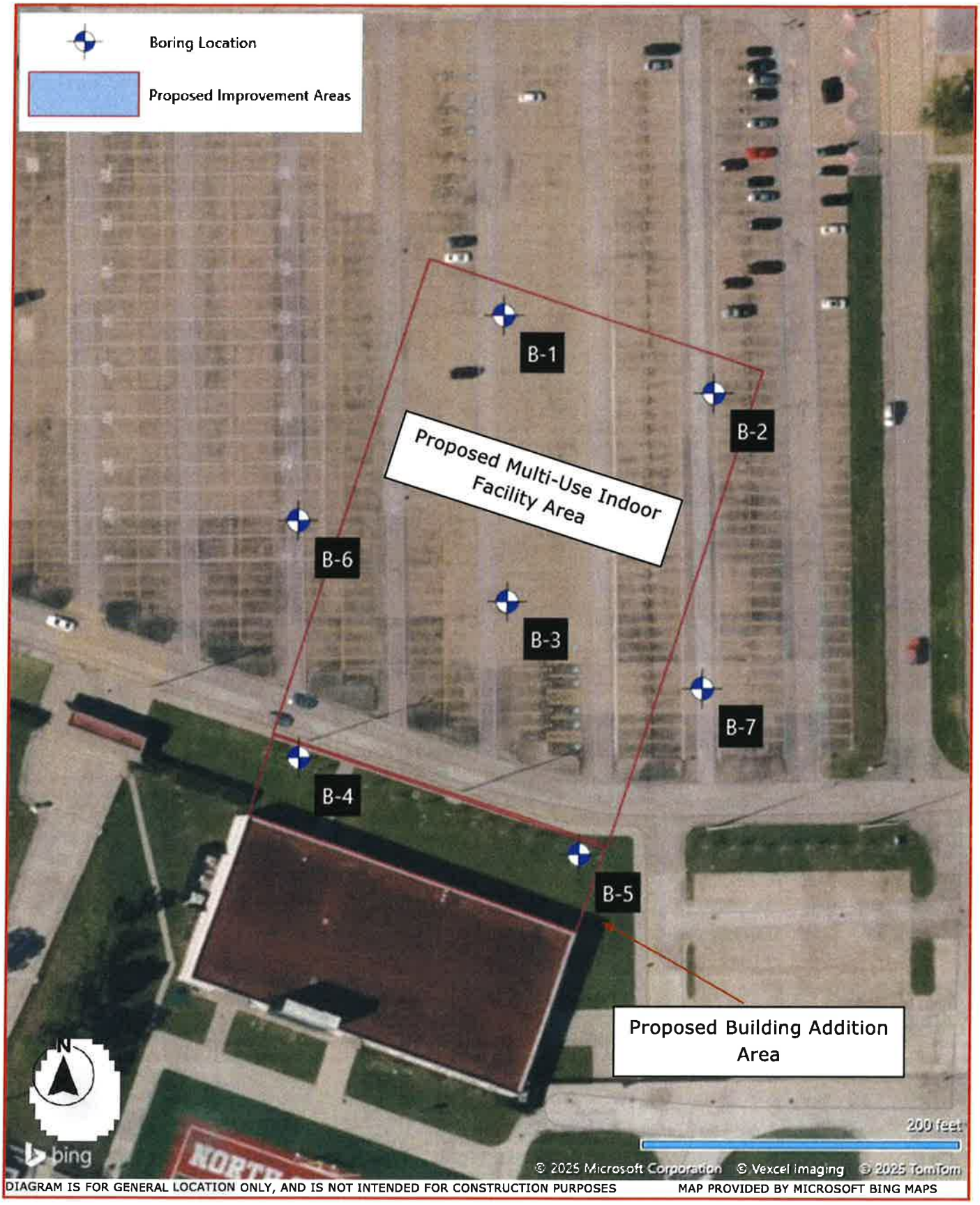


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-1 through B-7)

Note: All attachments are one page unless noted above.

Galena Park ISD North Shore High School Multi-Use Indoor Facility
353 North Castlegory Road | Houston, Texas
Terracon Project No. 92255219

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-1

Location: See Exploration Plan

Latitude: 29.8102° Longitude: -95.1759°

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
		0.3	**PAVEMENT**, approximately 4 inches of concrete											
1			**FILL - FAT CLAY (CH)**, dark gray and gray, with ferrous stains and nodules				0.5 (HP)				27.6		59-18-41	
							1.0 (HP)							
			- tan 4 to 8 feet	5			1.5 (HP)				26.4		60-19-41	
							0.75 (HP)							
		8.0												
2			**FAT CLAY (CH)**, light gray and reddish brown, stiff to very stiff, with ferrous stains, silt pockets, and calcareous nodules				1.25 (HP)	UC	1.03	5	27.1	98		
				10			2.0 (HP)							
			- with slickensides 13 to 18 feet											
				15			3.25 (HP)							
		18.0												
3			**SANDY LEAN CLAY (CL)**, light gray and tan, very stiff				3.25 (HP)							
				20	▽									
			- with calcareous nodules below 23 feet				3.5 (HP)							
		25.0		25										
			Boring Terminated at 25 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
▽ While drilling

Drill Rig
Truck

Driller
Herman Drilling

Logged by
K. Wright

Boring Started
06-18-2025

Boring Completed
06-18-2025

Notes

Advancement Method
Dry augered to 25 feet.

Abandonment Method
Boring backfilled with auger cuttings and patched at the surface with concete upon completion.

Galena Park ISD North Shore High School Multi-Use Indoor Facility
353 North Castlegory Road | Houston, Texas
Terracon Project No. 92255219

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-2

Location: See Exploration Plan

Latitude: 29.8101° Longitude: -95.1755°

Model Layer	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
	0.3	**PAVEMENT**, approximately 4 inches of concrete											
2		**FAT CLAY (CH)**, dark gray, medium stiff to very stiff, with ferrous stains				1.0 (HP)							
						1.0 (HP)				26.9		60-20-40	
		- with slickensides 4 to 6 feet	5			1.0 (HP)	UC	0.58	2.3	31.2	92		
		- light gray and reddish brown 6 to 18 feet				1.25 (HP)				28.6		69-20-49	
		- with calcareous nodules and silt pockets 8 to 18 feet				1.5 (HP)							
			10			0.75 (HP)	UC	1.12	4.7	27.0	97		99
				▼		2.25 (HP)							
			15	▽									
3	18.0	**SANDY LEAN CLAY (CL)**, light gray and tan, soft to medium stiff				1.0 (HP)							
			20	▽									
	25.0	***Boring Terminated at 25 Feet***				0.5 (HP)							
			25										

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
▽ While drilling
▽ After 5 minutes
▼ After 15 minutes

Drill Rig
Truck

Driller
Herman Drilling

Logged by
H. Zamudio

Boring Started
06-18-2025

Boring Completed
06-18-2025

Notes

Advancement Method
Dry augered to 25 feet.

Abandonment Method
Boring backfilled with auger cuttings and patched at the surface with concete upon completion.

Galena Park ISD North Shore High School Multi-Use Indoor Facility
353 North Castlegory Road | Houston, Texas
Terracon Project No. 92255219

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-3

Location: See Exploration Plan

Latitude: 29.8097° Longitude: -95.1759°

Model Layer	Depth (Ft.)	Material Description	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	**PAVEMENT**, approximately 4 inches of concrete									
2		**FAT CLAY (CH)**, dark gray, medium stiff to very stiff, with ferrous stains		1.0 (HP)				27.6		61-21-40	
				1.0 (HP)							
	5			1.5 (HP)				26.5		70-20-50	
		- light gray and reddish brown 6 to 18 feet		1.5 (HP)							
		- with calcareous nodules 8 to 18 feet		2.0 (HP)							
	10			2.5 (HP)	UC	1.99	5.3	22.0	107		
	18.0										
3		**SANDY LEAN CLAY (CL)**, light gray and tan, soft to very stiff, with calcareous nodules and ferrous stains		3.0 (HP)							
	15										
				3.0 (HP)							
	20										
	25.0			0.5 (HP)							
		Boring Terminated at 25 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
Truck

Driller
Herman Drilling

Logged by
K. Wright

Boring Started
06-18-2025

Boring Completed
06-18-2025

Notes

Advancement Method
Dry augered to 25 feet.

Abandonment Method
Boring backfilled with auger cuttings and patched at the surface with concete upon completion.

Galena Park ISD North Shore High School Multi-Use Indoor Facility
353 North Castlegory Road | Houston, Texas
Terracon Project No. 92255219

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-4

Location: See Exploration Plan

Latitude: 29.8095° Longitude: -95.1763°

Model Layer	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
	0.5	**PAVEMENT**, approximately 6 inches of concrete											
2		**FAT CLAY (CH)**, dark gray, stiff to very stiff, with ferrous stains				2.0 (HP)							
						1.5 (HP)				28.4		74-21-53	
		- light gray and tan 4 to 8 feet	5			2.0 (HP)				26.7			99
						1.75 (HP)				25.4		65-21-44	
		- reddish brown, with sand pockets and calcareous nodules 8 to 18 feet				3.0 (HP)							
		- with slickensides 10 to 13 feet	10			2.75 (HP)	UC	1.37	3.1	22.3	104		
	18.0					3.25 (HP)							
3		**SANDY LEAN CLAY (CL)**, light gray and tan, medium stiff to very stiff, with calcareous nodules and ferrous stains	15										
			20			1.0 (HP)							
	25.0					3.5 (HP)							
		Boring Terminated at 25 Feet	25										

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
- While drilling
- After 5 minutes
- After 15 minutes

Drill Rig
Truck

Driller
Herman Drilling

Logged by
B. Abboud

Boring Started
06-18-2025

Boring Completed
06-18-2025

Notes

Advancement Method
Dry augered to 25 feet.

Abandonment Method
Boring backfilled with auger cuttings and patched at the surface with concete upon completion.

Galena Park ISD North Shore High School Multi-Use Indoor Facility
353 North Castlegory Road | Houston, Texas
Terracon Project No. 92255219

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-5

Location: See Exploration Plan

Latitude: 29.8093° Longitude: -95.1758°

Model Layer	Graphic Log	Depth (Ft.)	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	1.0 (HP)				27.4		64-17-47	
			1.5 (HP)							
		5	2.0 (HP)				22.1		60-19-41	
			2.25 (HP)							
2		8.0	2.0 (HP)	UC	0.76	5.8	24.3	96		
		10	2.5 (HP)							
			0.75 (HP)							
		15								
3		18.0	3.0 (HP)							
		20								
		25.0	3.0 (HP)							
		25	Boring Terminated at 25 Feet							

FAT CLAY (CH), dark gray, medium stiff to very stiff, with ferrous stains

- light gray and tan 4 to 8 feet

SANDY FAT CLAY (CH), light gray and reddish brown, medium stiff to very stiff

SANDY LEAN CLAY (CL), light gray and reddish brown, very stiff, with calcareous nodules

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
- While drilling
- After 5 minutes
- After 15 minutes

Drill Rig
Truck

Driller
Herman Drilling

Logged by
H. Zamudio

Boring Started
06-18-2025

Boring Completed
06-18-2025

Notes

Advancement Method
Dry augered to 25 feet.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Galena Park ISD North Shore High School Multi-Use Indoor Facility
353 North Castlegory Road | Houston, Texas
Terracon Project No. 92255219

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-6

Location: See Exploration Plan

Latitude: 29.8099° Longitude: -95.1763°

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
		0.3	**PAVEMENT**, approximately 4 inches of concrete											
			FAT CLAY (CH), dark gray, stiff to very stiff, with ferrous stains				1.25 (HP)				23.8		63-21-42	
							2.0 (HP)							
			- light gray and tan, with sand pockets 4 to 8 feet											
2				5			2.0 (HP)	UC	1.52	4.6	23.3	106		
							2.25 (HP)							
			- reddish brown, with calcareous nodules below 8 feet											
							2.0 (HP)							
		10.0	***Boring Terminated at 10 Feet***	10										

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
Truck

Driller
Herman Drilling

Logged by
H. Zamudio

Boring Started
06-18-2025

Boring Completed
06-18-2025

Notes

Advancement Method
Dry augered to 10 feet.

Abandonment Method
Boring backfilled with auger cuttings and patched at the surface with concete upon completion.

Galena Park ISD North Shore High School Multi-Use Indoor Facility
353 North Castlegory Road | Houston, Texas
Terracon Project No. 92255219

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-7

Location: See Exploration Plan

Latitude: 29.8096° Longitude: -95.1755°

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
		0.6	**PAVEMENT**, approximately 7 inches of concrete											
3			**LEAN CLAY (CL)**, dark gray, medium stiff to stiff				1.0 (HP)				22.6		48-17-31	
							1.5 (HP)							
		4.0												
2			**FAT CLAY (CH)**, light gray and tan, stiff, with ferrous stains	5			1.75 (HP)	UC	1.68	9	22.8	103		
							2.0 (HP)							
		8.0												
			SANDY FAT CLAY (CH), light gray and tan, stiff				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
Truck

Driller
Herman Drilling

Logged by
B. Abboud

Boring Started
06-18-2025

Boring Completed
06-18-2025

Notes

Advancement Method
Dry augered to 10 feet.

Abandonment Method
Boring backfilled with auger cuttings and patched at the surface with concete upon completion.

DOCUMENT 00 65 00

RELEASE OF LIEN DOCUMENTS

APPENDIX INDEX:

1. **CONDITIONAL WAIVER FOR PROGRESS PAYMENTS**

2. **UNCONDITIONAL WAIVER FOR PROGRESS PAYMENTS**

3. **CONDITIONAL WAIVER FOR FINAL PAYMENT**

4. **UNCONDITIONAL WAIVER FOR FINAL PAYMENT**

[Note: the attached forms are duplicated *verbatim* (without editing) from HB 1456.]

FORM 1: CONDITIONAL WAIVER FOR PROGRESS PAYMENTS

* * * * * * *

CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

Project:

Job No.:

On receipt by the signer of this document of a check from _____
_____
(maker of check) in the sum of $_____
payable to _____
(payee or payees of check) and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the property of _____
_____
(owner) located at (location) to the following extent: _____
_____
_____
_____(job description).

This release covers a progress payment for all labor, services, equipment, or materials furnished to the property or to _____
(person with whom signer contracted) as indicated in the attached statement(s) or progress payment request(s), except for unpaid retention, pending modifications and changes, or other items furnished.

Before any recipient of this document relies on this document, the recipient should verify evidence of payment to the signer.

The signer warrants that the signer has already paid or will use the funds received from this progress payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project in regard to the attached statement(s) or progress payment request(s).

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

FORM 2: UNCONDITIONAL WAIVER FOR PROGRESS PAYMENTS

* * * * * * *

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. IT IS PROHIBITED FOR A PERSON TO REQUIRE YOU TO SIGN THIS DOCUMENT IF YOU HAVE NOT BEEN PAID THE PAYMENT AMOUNT SET FORTH BELOW. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

Project:

Job No.:

The signer of this document has been paid and has received a progress payment in the sum of $_____ for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) on the property of _____ (owner) located at _____ (location) to the following extent:_____

_____

_____

(job description). The signer therefore waives and releases any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the above referenced project to the following extent: _____

_____

_____

This release covers a progress payment for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) as indicated in the attached statement(s) or progress payment request(s), except for unpaid retention, pending modifications and changes, or other items furnished.

The signer warrants that the signer has already paid or will use the funds received from this progress payment to promptly pay in **full** all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project in regard to the attached statement(s) or progress payment request(s).

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

FORM 3: CONDITIONAL WAIVER FOR FINAL PAYMENT

* * * * * * *

CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project:

Job No.:

On receipt by the signer of this document of a check from _____
_____
_____(maker of check) in the sum of
$_____ payable to
_____
_____ (payee or payees of check) and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the property of _____
_____
(owner) located at _____
_____
(location) to the following extent:_____
_____
_____(job description).

This release covers the final payment to the signer for all labor, services, equipment, or materials furnished to the property or to _____
(person with whom signer contracted).

Before any recipient of this document relies on this document, the recipient should verify evidence of payment to the signer.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

FORM 4: UNCONDITIONAL WAIVER FOR FINAL PAYMENT

* * * * * * *

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. IT IS PROHIBITED FOR A PERSON TO REQUIRE YOU TO SIGN THIS DOCUMENT IF YOU HAVE NOT BEEN PAID THE PAYMENT AMOUNT SET FORTH BELOW. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project:

Job No.:

The signer of this document has been paid in full for all labor, services, equipment, or materials furnished to the property or to_____
_____
(person with whom signer contracted) on the property of_____
_____
_____ (owner) located at_____
_____
_____ (location) to the following extent _____
_____
:_____ (job description). The signer therefore waives and releases any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date: _____

_____(Company name)

By _____(Signature)

_____(Title)

--- THIS PAGE INTENTIONALLY BLANK ---

DOCUMENT 00 73 50

WEATHER TABLE

MONTH	AVERAGE DAYS RAIN (1)	INCHES RAINFALL (2)	SNOW/ICE PELLETS (3)
JANUARY	10.0	3.76	0.0
FEBRUARY	8.8	2.97	0.0
MARCH	8.8	3.47	0.0
APRIL	7.3	3.95	0.0
MAY	8.6	5.01	0.0
JUNE	10.0	6.00	0.0
JULY	9.1	3.77	0.0
AUGUST	8.5	4.84	0.0
SEPTEMBER	8.4	4.71	0.0
OCTOBER	7.7	5.46	0.0
NOVEMBER	7.6	3.87	0.0
DECEMBER	9.6	4.03	0.1
ANNUALLY	104.4	51.84	0.1

(1) Mean number of days rainfall, 0.01" or more.
(2) Mean precipitation, in inches.
(3) Mean number of days 1.0" or more.
* Less than 0.05".

This table is based on information reported from Houston Intercontinental Airport, Texas. Latitude 29.9800° N, Longitude -95.3600° W, elevation (ground) 95 feet.

Means are based on records covering a period of 30 years. Normals based on record for the 1991-2020 period.

END OF DOCUMENT

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work comprises the construction of the North Shore Multi-Use Indoor Facility for Galena Park Independent School District, Houston, Texas, as shown on the drawings and described in the specifications. The work will be done under one lump sum contract.

B. Indication on the drawings or mention in the specifications of articles, materials, operations or methods requires that the Contractor provide each item indicated or mentioned of the quality or subject to the qualifications noted, and perform according to the conditions stated each operation described and provide therefor all necessary labor, equipment, services and incidentals.
   1. Subcontractors are responsible for examining the architectural drawings for structural, mechanical, electrical, and plumbing items. Items shown on these drawings shall be furnished by the appropriate subcontractor.

1.2 SUMMARY

A. Related Requirements:
   1. Document Owner's Competitive Sealed Proposal Documents.
   2. Document General Conditions of the Contract for Construction: Provisions for use of site; Owner occupancy; Relations of Contractor - subcontractors.
   3. Document Supplementary Conditions to the Contract for Construction.
   4. Section 01 32 16 - Construction Progress Schedules: Format of work schedule.
   5. Section 01 45 23 - Testing and Inspection Services.
   6. Section 01 50 00 - Temporary Facilities and Controls.

1.3 CONDITIONS OF THE CONTRACT

A. The General Conditions and Supplementary Conditions, bound herewith as preceding portions of these specifications, form a part thereof and shall govern the work under each section.

1.4 EXISTING SITE CONDITIONS

A. Visit and examine the site. Upon award of the Contract, the Contractor shall accept the condition of the site before beginning the work required.

1.5 SPECIAL REQUIREMENTS

A. The present building houses an operating facility that must continue in operation during the construction period, except as the Architect and Owner may otherwise direct. Plumbing, heating, ventilating, electrical and telephone systems shall continue to function with a minimum of interruptions in service. Do not block required fire exits.

B. Assume responsibility for the protection of areas of work and provide and maintain protections required. Protect existing surfaces of the building and equipment, both interior and exterior, as required during the construction period. Provide necessary dust screens, drop cloths and temporary walls and/or coverings as may be required for protection. Existing surfaces that are damaged due to construction shall be patched or replaced to original condition.

C. Where designated on the drawings, salvage, relocate and reinstall certain items. Existing items so designated shall be properly installed, securely fastened as required, set plumb and level and left complete and operational. Exercise extensive care in relocating such items so as to prevent damage. Other existing building materials indicated to be removed or demolished, unless noted otherwise or claimed by the Owner shall become property of the Contractor and shall be removed from the site immediately.

D. Wherever exterior walls are to be demolished or existing doors replaced, the exposed portion of the existing building shall be protected by the Contractor against the elements, construction debris and intrusion by unauthorized persons, by means subject to approval of the Architect.

E. Execute Certificate of Substantial Completion for each designated portion of work prior to Owner occupancy. Following execution of a Substantial Completion Certificate for a designated portion of the work, the Contractor shall permit:
   1. Access for Owner personnel.
   2. Use of parking facilities for the benefit of the Owner.
   3. Operation of HVAC and electrical systems for the benefit of the Owner.

   Despite partial Owner occupancy, the Contractor shall remain responsible for portions of the work which have not attained Substantial Completion and for which a Substantial Completion Certificate, which shall designate the date on which the Owner shall become responsible for utilities, maintenance, security, damage to the work and insurance, has not been executed.

F. The loop fire lane and fire hydrants are required by the City to be in place and operational during construction at existing buildings and prior to steel erection at new buildings.

1.6 SEQUENCE OF CONSTRUCTION

A. Work shall be started upon formal “Notice-to-Proceed”.

B. PHASE 1: Commence the work of Phase 1 construction on the Multi-Use Facility building and Weight Room Substantial Completion date shall be February 14, 2027.

C. The new Galena Park ISD Multi-Use Facility and weight room portion of the project must be substantially completed by February 14, 2027, and completed prior to the commencement of the renovation work that is to be done to the existing Fieldhouse.

D. No phase may begin before its indicated date without prior approval of the Owner.

E. PHASE 2 RENOVATION TO EXISTING FIELDHOUSE: Commence the work of Phase 2 after the completion of Phase 1. The Substantial Completion date shall be August 1, 2027.

1.7 CONTRACTOR USE OF PREMISES

A. Limit use of premises for work, for storage and for access, to allow for Owner occupancy.

B. Coordinate use of premises under direction of Owner.

C. Assume full responsibility for protection and safekeeping of products under this contract.

D. Obtain and pay for use of additional storage or work areas needed when required for operations under this Contract.

E. During construction the Owner will continue to perform normal activities in and around the adjacent existing building. Proper and safe access to the Owner-occupied areas shall be maintained. Interruption of mechanical and electrical services to the building shall be only at such times and for lengths of time as approved by the Owner.

F. There shall be no storage of materials or equipment in the occupied portions of the existing building. There shall be no fires on the site or in the building. There shall be no dumping on Owner's property.

G. Worker Identity Badging Requirements: Provide construction personnel (including subcontractors and suppliers regularly visiting the project site) with identification badges, with photograph. Identification badges shall be worn visibly by construction personnel on the construction site or on Owner’s property. NO EMPLOYEE WILL BE PERMITTED ON SITE WITHOUT THIS BADGE DISPLAYED ON THE EMPLOYEE. Contractor must assure that the Crisis Management contact information is provided on the reverse side of each worker’s badge. Temporary or visitor badges will be provided for persons who are identified as having an infrequent or temporary legitimate business need for access to the site.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed on the project site during normal business working hours of 6:00 a.m. to sundown, Monday through Friday or City ordinance or outlined in the Owner's Contract documents; whichever is more restrictive.
   1. Weekend Hours: Comply with City ordinance restrictions for weekend work. No work shall be performed on Sundays, unless specifically allowed by City and Owner.
   2. Early Morning Hours: Comply with City noise ordinances for restriction of early-morning concrete pours and other noisy construction activities. Owner's testing laboratory personnel will be available only during on-site work hours listed above.

1.9 Work Restrictions within Existing Building(s): Work shall be generally performed inside the existing building during the summer break and after normal school classes Monday through Friday. During student holidays when the faculty and staff may be on campus, extent of work and utility interruption shall be coordinated with the Owner in advance. On dates designated as STAAR and/or EOC testing days, work within the existing building is not allowed and work in other areas may need to be limited to keeping down the amount of noise and distraction for the students. Work on these days shall be coordinated with the Owner in advance.

1.10 OWNER-FURNISHED PRODUCTS

A. Contractor Responsibilities
   1. Protect products from damage.
   2. Repair or replace items damaged by Contractor.
   3. Make all necessary electrical and plumbing service connections to Owner supplied Equipment.

B. Schedule of Owner-furnished items
   1. Refer to Drawings.

1.11 COORDINATION

A. Drawing details and other sections of these specifications covering work connected with or relating to that specified under a specific heading shall be examined for conditions which may affect that part of the work. Failure to do so will not relieve those furnishing materials and/or labor under a specification heading from supplying materials or performing work reasonably necessary to properly coordinate their work with that of other trades.

1.12 LAYING OUT WORK, MEASUREMENTS

A. Employ a competent engineer or surveyor to establish and maintain lines and levels. Establish and maintain at least two elevation bench marks remote from each other and located outside the building area. Set alignment and location stakes.

B. Verify measurements at the building. No extra compensation will be allowed for differences between actual dimensions and dimensions indicated on the drawings. Figured dimensions and measurements taken at the site shall take precedence over scaled dimensions.

1.13 DISCREPANCIES

A. In case of discrepancies within the drawings, within the specifications, or between the drawings and specifications, the better quality and greater quantity, in the opinion of the Architect, shall be furnished and installed.

1.14 PIPING

A. Should active piping or conduit be encountered below grade within the building structure and be found at variance with the known conditions indicated by the drawings and specifications, said piping and/or conduit shall be relocated as required by the Architect, and the contract sum shall be fairly adjusted on the basis of the cost of labor and materials. The Contractor shall provide temporary support of active piping and conduit encountered in the excavations until permanently supported or removed. The Contractor shall cut off and cap or plug abandoned lines at least 3 ft. outside the building lines. Conform to the applicable requirements of the locality or governing agency.

1.15 PROTECTION

A. General: Limit use of the premises to construction activities in areas indicated; allow for Owner occupancy in adjacent spaces and around the site.
   1. Confine operations to areas within Contract limits indicated. Portions of the building which are outside the areas construction operations are indicated, are not to be disturbed.
   2. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees. Do not use these areas for parking or storage of materials without prior approval. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
   3. Do not dispose of organic and hazardous material on site, either by burial or by burning. Disposable material and trash must be removed properly.

B. Assume responsibility for the premises and provide and maintain protections required by the governing laws, regulations and ordinances. The Contractor shall be responsible for loss or damage caused by him or his workmen to the property of the Owner or to the work or materials installed, and shall make good loss, damage or injury without cost to the Owner.

C. The protection of adjacent property shall include but will not necessarily be limited to the erection and maintenance of shoring, underpinning and fences as necessary to protect and support existing work to be left in place.

D. Finished floors shall be protected against damage by workmen and equipment during the work. Where materials are carried into the building, the building floors shall be covered to protect the work against dirt or grit being ground in.

E. Where existing roofing, flashing, exterior walls, doors and windows are removed, the openings and exposed portions of the construction shall be covered and protected so as to be weathertight until new work is in place.

F. Where work is being done on the existing building, the furniture, fixtures and equipment in the building shall be covered with heavy plastic sheeting or clean tarpaulins to protect the property against damage and stains. The furniture and equipment shall not be removed from the building.

G. Trees and shrubs on the site which do not have to be removed for the new work shall be protected against damage. No Contractor shall remove or trim trees and shrubs in the area without the express approval of the Architect.

H. Send proper notices, make necessary arrangements and perform other services required for the care, protection and maintenance of Public Utilities, including fire plugs and wires and other items of this character on and around the building site.

I. Maintain accessible building exits required by the City during construction. Protection of these exits shall include dust-proof enclosures, illumination and exit lighting required.

J. While school is in session, provide appropriate measures to control the migration of dust and odors into occupied areas of the school.

1.16 CUTTING AND PATCHING

A. Cutting and chasing of existing construction for relocation of mechanical and electrical work and for installation of pipes and ducts will be done by the trades concerned. Patching and finishing shall be done by the Contractor. This work shall be done with proper tools and by careful workmen of the particular trade to which such work belongs and shall be done without extra cost to the Owner.

1.17 RECORD DRAWINGS

A. Maintain a complete clean set of drawings and Project Manual in the project field office for the sole purpose of recording "installed" conditions. Installed conditions shall include addendum items, change orders, or other items which come up during the construction phase which deviate from the Construction Documents. Changes made in these drawings and Project manual in connection with the final construction and installation shall be neatly made in red ink. Upon completion of the project, the marked set of drawings and Project Manual shall be delivered to the Architect for subsequent transmittal to the Owner. These drawings shall be maintained to reflect the current conditions of the work and changes shall be reviewed on a monthly basis with the Architect’s representative. The Contractor's updating of the "installed" condition drawings and Project Manual shall be a prerequisite to the monthly review of the Contractor's payment request by the Architect's representative.

1.18 INSTRUCTIONS CONCERNING ASBESTOS

A. In the event the Contractor encounters on the site material reasonably believed to be asbestos which has not been rendered harmless, the Contractor shall immediately stop work in the area affected and report the condition to the Owner in writing. If, in fact the material is asbestos and has not been rendered harmless, the work in the affected area shall not thereafter be resumed until the asbestos has been removed or rendered harmless by the Owner. The work in the affected area shall be resumed in the absence of asbestos, or when it has been rendered harmless, by written agreement of the Owner and Contractor.

B. The Contractor will not be required to perform without consent work relating to asbestos.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements governing allowances.
   1. Certain materials and equipment are specified in the contract documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by change order.

B. Related Requirements:
   1. General Conditions of the Contract for Construction.
   2. Section 01 22 00 - Unit Prices; procedures for using unit prices.
   3. Section 01 32 16 - Construction Progress Schedules: Product delivery and installation dates.
   4. Individual Specifications Sections Listed Under Schedule of Allowances: Specification of products and installation under allowances.

1.2 COSTS INCLUDED IN ALLOWANCES

A. Cost of product to Contractor or subcontractor, less applicable trade discounts.

B. Delivery to site.

C. Applicable taxes.

1.3 CONTRACTOR COSTS INCLUDED IN CONTRACT SUM

A. Products handling at site, including unloading, uncrating and storage.

B. Protection of products from elements and from damage.

C. Labor for installation and finishing.

D. Other expenses required to complete installation.

E. Contractor overhead and profit.

1.4 ADJUSTMENT OF COSTS

A. Should the net cost be more or less than the specified amount of the allowance, the contract sum will be adjusted accordingly by change order.

B. Submit any claims for anticipated additional costs at the site, or other expenses caused by the selection under the allowance, prior to execution of the work.

C. Submit documentation for actual additional costs at the site, or other expenses caused by the selection under the allowance, prior to execution of the work.

D. Failure to submit claims within the designated time will constitute a waiver of claims for additional costs.

1.5 ARCHITECT RESPONSIBILITIES

A. Consult with Contractor in consideration of products, suppliers and installers.

B. Select products, obtain Owner's written decision, and transmit full information to Contractor as follows
   1. Manufacturer, product, model or catalog number, accessories, attachments and finishes.
   2. Supplier and installer as applicable.

3. Cost to Contractor, delivered to site (and installed, if so specified).

1.6 CONTRACTOR RESPONSIBILITIES

A. At the earliest practical date after award of the contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the work.

B. Assist Architect in determining suppliers; and installers; obtain proposals when requested.

C. Make recommendations for Architect consideration.

D. Promptly notify Architect of any reasonable objections against supplier or installer.

E. On notification of selection execute purchase agreement with designated supplier and installer.

F. Arrange for and process shop drawings, product data and samples.

G. Arrange for delivery. Promptly inspect products upon delivery for completeness, damage and defects. Submit claims for transportation damage.

H. Install, adjust and finish products.

I. Provide warranties for products and installation.

1.7 CORRELATION WITH CONTRACTOR SUBMITTALS

A. Schedule shop drawings, product data, samples and delivery dates, in progress schedule for products selected under allowances.

PART 2 - PRODUCTS – Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate allowance work with related work to ensure proper integration and interface.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Allow the lump sum of $ $960,000.00.00 Owner’s Contingency for the changes requested by the Owner.

B. Allowance No. 2: Allow the lump sum of $15,000.000.00 for post-construction Texas Accessibility Standards (TAS) inspection compliance.

C. Allowance No. 3: Allow the lump sum of $100,000.00 for Super Graphics.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Included:
   1. Identification and description of alternate work.
   2. The amount shown in the proposal form for each alternate shall include all overhead, profit, insurance and other costs incidental to the performance under the alternate.

B. Related Requirements:
   1. Proposal Form: Quotation of cost of each alternate.
   2. Contract Form: Alternates accepted by Owner for incorporation into the work.
   3. Section of specifications identified in each alternate.

1.2 PROCEDURES

A. Proposers are required to submit alternate amounts 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 shall be 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 30 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 alternates. Claims for additional costs or time extensions resulting from changes to the Work as a result of the Owner's election of any or all alternates will not be allowed.

D. Refer to drawings and technical specifications sections for items of work affected by alternates.

E. Election of alternates will be exercised at the option of Owner.

F. Coordinate related work and modify or adjust surrounding work as required to complete the Work, including changes under each alternate.
   1. Include as part of each alternate, miscellaneous devices, accessory objects and similar items incidental to, or required for, a complete installation whether or not indicated as part of alternate.
   2. Cost listed for each alternate include cost of related coordination, modification, or adjustment.

G. Notification: Immediately following the award of contract, Contractor shall prepare and distribute to each entity or person to be involved in the performance of the Work, a notification of the status of each alternate scheduled herein. Indicate which alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates, if any.

1.3 SELECTION AND AWARD OF ALTERNATES

A. Indicate variation in base proposal amount as a result of the prices for the alternates described below and listed on the proposal form document or any supplement to it, by adding to, or deducting from, the base proposal amount or by indicating "No Change."

B. Indicating "No Proposal" as an alternate is unacceptable and is reason for rejection of proposal.

1.4 SCHEDULE OF ALTERNATES

A. Alternate No. 1: State in the proposal form the amount to be added to the base proposal for providing a base proposal reduction.

B. Alternate No. 2: State in the proposal form the amount to be added to the base proposal for providing a 120-yard indoor practice facility in lieu of an 80-yard indoor practice facility.

C. Alternate No. 3: State in the proposal form the amount to be added to the base proposal for providing the renovation of the coach's offices and training area in existing field house. Lavatory replacement in these areas are to be provided in the base bid and not to be included in this alternate.

D. Alternate No. 4: State in the proposal form the amount to be added into the base proposal for providing the brick veneer and metal wall panel system in the existing field house.

E. Alternate No. 5: State in the proposal form the amount to be added to the base proposal to furnish and install the following Air Handling Units as listed in the specifications. Include estimated lead time/delivery to be assessed as part of the selection process.
   1. Alternate No. 5a: Carrier Air Handling Units
   2. Alternate No. 5b: Temtrol Air Handling Units
   3. Alternate No. 5c: Trane Air Handling Units

F. Alternate No. 6: State in the proposal form the amount to be added to the base proposal to furnish and install the following Chillers as shown in the Contract Documents. Include estimated lead time/delivery to be assessed as part of the selection process.
   1. Alternate No. 6a: Carrier Standard Efficiency Chillers
   2. Alternate No. 6b: Carrier High Efficiency Chillers
   3. Alternate No. 6c: Trane Standard Efficiency Chillers
   4. Alternate No. 6d: Trane High Efficiency Chillers
   5. Alternate No. 6e: York Standard Efficiency Chillers
   6. Alternate No. 6f: York High Efficiency Chillers

G. Alternate No. 7: State in the proposal form the amount to be added to the base proposal to furnish and install the following BMCS system.
   1. Alternate No. 7a: Reliable Controls by Unify Energy Solutions BMCS system.
   2. Alternate No. 7b: Trane Controls by Hunton Group BMCS system.
   3. Alternate No. 7c: by Automated Logic Houston BMCS system.
   4. Alternate No. 7d: Distech Controls by TDI BMCS system.

H. Alternate No. 8: State in the proposal form the amount to be added to the base proposal to furnish and install the turf for the indoor practice facility.
   1. Alternate No. 8a: FieldTurf turf for the indoor practice facility.
   2. Alternate No. 8b: Hellas turf for the indoor practice facility.
   3. Alternate No. 8c: Mammoth turf for the indoor practice facility.

I. Alternate No. 9: State in the proposal form the amount to be added to the base proposal to furnish and install the turf in the new weight room.
   1. Alternate No. 9a: FieldTurf turf in the new weight room.
   2. Alternate No. 9b: Hellas turf in the new weight room.
   3. Alternate No. 9c: Mammoth turf in the new weight room.

J. Alternate No. 10: State in the proposal form the amount to be added to the base proposal to furnish and install the rubber flooring in the new weight room. The amount should include both rubber flooring and turf.
   1. Alternate No. 10a: Tarkett rubber flooring in the new weight room.
   2. Alternate No. 10b: ProMaxima rubber flooring in the new weight room.
   3. Alternate No. 10c: Mondo rubber flooring in the new weight room.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Applications and Certificates for Payment.
2. Change Order Procedures.
3. Schedule of Values: Submit to the Architect and the Program Manager the Schedule of Values allocated to various portions of the work within five days after "Notice-to-Proceed". Upon request of Architect, support values with data which will substantiate their correctness.

B. Related Requirements:
1. Conditions of the Contract for Construction.
2. Section 01 32 16 - Construction Progress Schedules.
3. Section 01 77 00 - Closeout Procedures.
4. Section 01 78 39 - Project Record Documents.

1.2 APPLICATIONS AND CERTIFICATES FOR PAYMENT

A. Progress payments shall be made as the work proceeds at intervals stated in the Contract.

B. Work covered by progress payments shall, at the time of payment, become the property of the Owner.

C. Form of Application and Certificate for Payment shall be notarized AIA Document G702 - Application and Certification for Payment, supported by AIA document G703 - Continuation Sheet. Submit two hard copies. Architect will retain a digital copy and return signed hard copies to the Owner and Contractor.

D. Conditions governing regular schedule for applications, payment and retainage are as stated in the Contract.

E. With each Application for Payment, Contractor shall certify that such Application for Payment represents a just estimate of cost reimbursable to Contractor under terms of Contract.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Application for payment of materials and equipment stored off-site will only be considered if such payment application has been approved in advance by the Owner, and:
a. Items are suitably stored off the site at a location agreed upon in writing;
b. Items are stored locally for verification by the Architect;
c. Certificate of insurance for storage facility has been provided;
d. Evidence of transfer of title to Owner has been provided;
e. Consent of surety to payment for materials stored off-site has been provided; and
f. Compliance by Contractor has been attained for any other procedures satisfactory to the Owner to establish the Owner’s title to such materials and equipment or otherwise protect the Owner’s interest.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on materials stored off-site.
3. No application for payment may be submitted for raw materials stored off-site.

1.3 CONSTRUCTION CHANGE ORDER PROCEDURES

A. Contractor to submit to Architect within five days of execution of Owner/Contractor Agreement name of individual authorized to accept changes on behalf of Contractor, and to be responsible for informing others in Contractor's employ of changes in the work.

B. Change Order forms will be furnished and issued by Architect.

C. Contractor Documentation of Changes:

1. Maintain detailed records of work done on an accounting basis acceptable to Architect and Owner. Provide full information required for evaluation of proposed changes.
2. Document each quotation for a change in cost or time with sufficient data to allow evaluation of quotation.
3. On request, provide additional data to support computations:
   a. Quantities of products, labor and equipment.
   b. Insurance and bonds.
   c. Overhead and profit.
   d. Justification for any change in Contract Time.
   e. Credit for deletions from Contract, similarly documented.
4. Support each request for additional costs, and for work proposed on a time and material basis, with description of products, equipment, cost of labor and subcontracts, completely documented.
5. Computation for changes in work will be computed in one of the manners described in the Conditions of the Contract.

D. Initiation of Changes:
   1. Architect may submit Proposal Request which includes detailed description of change with supplementary or revised drawings and specifications.
   2. Contractor may initiate a proposed change by submittal of a request to Architect describing proposed change with statement of reason for change, and proposed effect on Contract Sum and Contract Time with full documentation and a statement of the effect on work of separate contractors. Document any requested substitutions in accordance with SECTION 01 62 00 - PRODUCT OPTIONS. Submission of such requests and receipt of same by Architect does not mean acceptance, or approval of proposed change.

E. Authorization:
   1. The Owner may request, through the Architect, a Construction Change Directive, in writing, instructing Contractor to proceed with changes of all or in part of work, for subsequent inclusion in a Change Order that is pending. Directive will propose basis for necessary adjustments, if any, to Contract Sum or Time.
   2. Changes that affect Contract Sum and/or Contract Time will require a Change Order signed by the Owner and the Architect. Contractor's signature indicates agreement. Other orders, written or oral, by the Owner through the Architect or by the Architect shall be treated as a Change Order only if Contractor gives Owner proper written notice as described in Conditions of Contract.
   3. Promptly execute the change in work only upon receipt of approved Change Order or Owner's written Construction Change Directive.

F. Execution:
   1. Architect will issue Change Orders for signatures of parties as provided in Conditions of Contract.
   2. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust Contract Sum as shown on Change Order.
   3. Promptly revise Progress Schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by Change, and resubmit Schedule.
   4. Promptly enter Changes in Project Record Documents.

1.4 SCHEDULE OF VALUES FORM AND CONTENT

A. Type schedule on 8-1/2" x 11" white paper; Contractor's standard forms and automated printout will be considered for approval by Architect upon Contractor's request. Identify schedule with:
   1. Title of project and location.
   2. Architect and Architect's project number.
   3. Name and address of Contractor.
   4. Contract designation.
   5. Date of submission.

B. Follow the table of contents of this project manual as the format for listing component items.
   1. Identify each line item with the number and title of the respective major section of the specifications.

C. For each major line item list sub-values of major products or operations under the item.

D. For the various portions of the work:
   1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
   2. For items on which progress payments will be requested for stored materials, break down the value into that listed above differentiating between stored on-site and stored off-site:

a. Cost of the materials, delivered and unloaded, with taxes paid.
b. Total installed value.

3. Submit a subschedule for each separate stage of work in SECTION 01 11 00 - SUMMARY OF WORK.

E. The sum of values listed in the schedule shall equal the total contract sum.

F. Indicate separate value associated with materials and labor.

G. Re-submittal: After review by Architect, revise and resubmit schedule as necessary.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Coordination of work of the contract.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Sequence of construction and Owner occupancy.
2. Section 01 31 19 - Project Meetings.
3. Section 01 50 00 - Temporary Facilities and Controls: Architect's project management system.
4. Section 01 62 00 - Product Options.
5. Section 01 73 29 - Cutting and Patching.
6. Section 01 77 00 - Closeout Procedures: Closeout submittals.

1.2 DESCRIPTION

A. Coordinate scheduling, submittals and work of the various sections of specifications to ensure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

B. Coordinate sequence of work to accommodate Owner occupancy as specified in SECTION 01 11 00 - SUMMARY OF WORK.

1.3 MEETINGS

A. In addition to progress meetings specified in SECTION 01 31 19 - PROJECT MEETINGS, hold coordination meetings and pre-installation conferences with personnel and subcontractors to ensure coordination of work.

1.4 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals specified in SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Coordinate work of various sections having interdependent responsibilities for equipment, such as installing, connecting to and placing in service.

C. Coordinate requests for substitutions to ensure compatibility of space, of operating elements and effect on work of other sections.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified. Reference SECTION 01 50 00 - TEMPORARY CONTROLS for Architect's project management system.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
3. Contractor shall always include a proposed solution along with the RFI.
4. RFI’s submitted to the Contractor by subcontractors, vendors, suppliers, or other parties to the Work shall be reviewed by the Contractor prior to submission to the Architect. If the Architect deems that such RFI requests have not been adequately reviewed by the Contractor, such requests will be returned to the Contractor for further action.

5. RFI requests are limited to a request for interpretation or clarification of the requirements of the Contract Documents. Interpretations provided by the Architect shall not change the requirements of the Contract or the Contract Documents. If the Contractor determines that the Architect's response to an RFI gives cause for a change in the Contract or the Contract Documents, the Contractor shall promptly, within 5 working days, give written notice to the Architect of request for adjustments. Requests for adjustments to the Contract shall be submitted in a manner consistent with the terms and conditions of the Contract Documents.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect.
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches

C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.

1.6 COORDINATION OF SPACE

A. Coordinate use of project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on drawings. Follow routings shown for pipes, ducts and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance and for repairs.

B. In finished areas, except as otherwise shown, conceal pipes, ducts and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

1.7 COORDINATION OF CONTRACT CLOSEOUT

A. Coordinate completion and cleanup of work of separate sections in preparation for substantial completion of portions of work designated for Owner partial occupancy.

B. After Owner occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with contract documents, to minimize disruption of Owner's activities.

C. Assemble and coordinate closeout submittals specified in SECTION 01 77 00 - CLOSEOUT PROCEDURES.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Scheduling and administration of progress meetings.
   2. Pre-installation conferences.

B. Related Requirements:
   1. Section 01 31 00 - Project Management and Coordination.
   2. Section 01 31 19.13 - Preconstruction Meetings: Owner's preconstruction conference and pre-mobilization conference.
   3. Section 01 32 16 - Construction Progress Schedules.
   4. Section 01 33 23 - Shop Drawings, Product Data and Samples.
   5. Section 01 45 00 - Quality Control.
   6. Section 01 78 23 - Operation and Maintenance Data.
   7. Section 01 78 39 - Project Record Documents.

1.2 PROGRESS MEETINGS

A. The Contractor will schedule monthly construction progress meetings, throughout progress of work. They will prepare agenda and distribute notice of each meeting to participants.

B. Contractor shall make physical arrangements.

C. Contractor will preside at meetings and issue meeting minutes.

D. Location of Meetings: Contractor's field office.

E. Attendance: Contractor, job superintendent, Program Manager and Architect. Owner and professional consultants will attend as appropriate. Subcontractors and suppliers shall attend as Architect or Contractor sees necessary to agenda.

F. Anticipated Agenda:
   1. Review of any outstanding old business from prior meeting minutes.
   2. Review of Contractor's updated Construction Schedule, including minimum two-week look ahead schedule.
   3. Review of work in-progress.
   4. Field observations and decisions.
   5. Status of correction of deficient items.
   6. Review of outstanding RFI’s.
   7. Identification of problems which impede planned progress.
   8. Review of submittal schedule and status of submittals, including pending submittals and resubmittals.
   9. Review of off-site fabrication and delivery schedules.
   10. Corrective measures to regain projected schedules if project is behind schedule.
   11. Review of quality and work standards.
   12. Review of Proposal Request and Change Proposal Logs, including any known pending changes.
   13. Effect of proposed changes on progress schedule and coordination.
   14. Review of Contractor’s updates to Project Record Documents.
   15. Review and signing of formal Application for Payment, as applicable.
   16. For Construction Manager projects, discuss variances between actual and estimated GMP costs.
   17. Other business relating to work.

1.3 PRE-INSTALLATION CONFERENCES

A. When required in individual specification section, convene a pre-installation conference at work site prior to commencing work of the section.

B. Require attendance of entities directly affecting, or affected by, work of the section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda, preside at conference, record minutes and distribute copies within two days after conference to participants.

E. Review conditions of installation, preparation and installation procedures and coordination with related work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 31 19.13

PRECONSTRUCTION MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Contractor participation in preconstruction meetings.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Administrative provisions.
2. Section 01 31 00 - Project Management and Coordination.
3. Section 01 31 19 - Project Meetings.

1.2 PRECONSTRUCTION MEETING

A. Architect will schedule meeting within 15 days after notice of award.

B. Attendance: Owner, Architect, Program Manager, General Contractor and representatives of major subcontractors.

C. Agenda
1. Submittal of executed bonds and insurance certificates.
2. Execution of Owner-Contractor Agreement.
3. Distribution of Contract Documents.
4. Submittal of list of subcontractors, list of products, schedule of values and progress schedule.
5. Designation of responsible personnel.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, change orders, allowances and Contract closeout procedures.
7. Scheduling.
8. Use of premises by Owner and Contractor.
9. Owner's requirements and occupancy.
10. Temporary facilities.
11. Survey and building layout.
12. Security and housekeeping procedures.
13. Procedures for testing.
14. Procedures for maintaining record documents.
15. Requirements for startup of equipment.
16. Accessibility Issues.
17. Inspection and acceptance of equipment put into service during construction period.
18. Notice to proceed.
19. Color samples.
20. Procedures for site meetings.
21. Site access and security.
22. Procedures and processing of TEA “Certification of Project Compliance” form.
23. Substantial and final project completion procedures.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Procedures for preparation and submittal of digital construction progress schedules and periodical updating.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Work sequence.
2. Section 01 21 00 - Allowances.
3. Section 01 29 00 - Payment Procedures: Schedule of Values.
4. Section 01 33 23 - Shop Drawings, Product Data and Samples.

1.2 SUBMITTALS

A. Within 14 days of the contract date, Contractor shall prepare and submit a digital Critical Path construction schedule for the work. After review, resubmit required revised data within 5 days.

B. Submit revised digital Critical Path Construction Schedule monthly with each Application for Payment.

C. Submit under transmittal letter specified in SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

1.3 WORK SCHEDULE FORMAT

A. The schedule shall not exceed time limits current under the Contract Documents and shall be subject to the approval of the Architect. The Contractor shall prosecute the work vigorously and make every effort to start and complete each phase of the work on or before the dates stated.

B. Should actual construction of project vary from the Critical Path schedule, Contractor shall take whatever actions are necessary to improve progress as quickly as possible in order to meet pre-determined milestones. Revise and re-submit schedule not less than every 30 calendar days. Presentation of the existing or updated Critical Path schedule, in three copies, along with the Certificate of Payment Request shall be a prerequisite to the monthly review of the payment request by the Architect's representative.

C. Sequence of Listings: The chronological order of the start of each item of work.

D. Scale and Spacing: To provide space for notations and revisions.

E. Sheet Size: Minimum 11" x 17".

1.4 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by major specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each stage of work identified in SECTION 01 11 00 - SUMMARY OF WORK.

E. Provide sub-schedules to define critical portions of entire schedule.

F. Show accumulated percentage of completion of each item, and total percentage of work completed, as of the first day of each month.

G. Provide separate schedule of submittal dates for shop drawings, product data and samples, including Owner furnished products and products specified under Allowances, and dates reviewed submittals will be required from Architect. Show decision dates for selection of finishes.

H. Show delivery dates for Owner furnished products and products specified under Allowances.

I. Coordinate content with SECTION 01 29 00 - PAYMENT PROCEDURES, Schedule of Values.

1.5 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope and other identifiable changes.

C. Provide narrative report to define problem areas, anticipated delays and impact on Schedule. Report corrective action taken, or proposed and its effect.

1.6 DISTRIBUTION

A. Distribute copies of reviewed schedules to job site file, subcontractors, suppliers and other concerned entities.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Digital submission of shop drawings.

B. Related Requirements:
1. General Conditions of the Contract for Construction: Definitions and basic responsibilities of entities.
2. Section 01 31 00 - Project Management and Coordination: Coordination of submittals.
3. Section 01 32 16 - Construction Progress Schedules: Schedules for submittals.
4. Section 01 45 00 - Quality Control: Mockups and samples for testing.
5. Section 01 50 00 - Temporary Facilities and Controls: Project management software.
6. Section 01 62 00 - Product Options.
7. Section 01 78 23 - Operation and Maintenance Data.
8. Section 01 78 39 - Project Record Documents.

1.2 GENERAL

A. Digital Submittals: Submit to the Architect shop drawings, product data, and samples required by specification sections. Do not submit illegible fax copies nor carbon copies of shop drawings and product data.
1. Submit using the Architect's web-based project management program (Newforma Info Exchange). Prepare submittals as .pdf files, with a single file for each submittal, and upload to the Architect's project management program. Enter required data in program to fully identify submittal in accordance with the required submittal numbering format.

B. Within **20** days of the contract date Contractor shall prepare and submit with the Schedule of Values 3, (2 for the Owner) copies of the comprehensive schedule of shop drawings, product data and samples. This schedule shall include products which are proposed for substitution. Also include the estimated date of each submittal and anticipated date of submittal return. Allow the Architect reasonable time to review submittals.
1. The schedule shall be submitted as an action submittal using the "Submittal" feature in the Architect's project management program (Newforma Info Exchange).

C. Prepare schedule on basis of each specification section.

D. For products specified under reference standards, include with listing of each product:
1. Name and address of manufacturer.
2. Trade name.
3. Model or catalog designation.
4. Manufacturer's data, including performance and test data, reference standards.

1.3 SHOP DRAWINGS

A. Prepared by a qualified detailer. Prepare project-specific information, drawn accurately to scale. Do not base shop drawings on reproductions of the contract documents or standard printed data. Include supplier's / detailer's / manufacturer's title block.

B. Identify details by reference to sheet and detail numbers shown on Contract Documents.

C. Present in a clear and thorough manner original drawings which illustrate the portion of the work showing fabrication, layout, setting, or erection details, prepared by a qualified detailer. Title each drawing with Project and Contract name and number; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

1.4 PRODUCT DATA

A. Manufacturer's standard schematic drawings and diagrams:
1. Modify drawings to delete information which is not applicable to the work.

2. Supplement standard information to provide additional information specifically applicable to the work.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:
   1. Clearly mark each copy to identify pertinent materials, products or models.
   2. Show dimensions and clearances required.
   3. Show performance characteristics and capacities.
   4. Show wiring or piping diagrams and controls.

C. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to specification section and Article number. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

1.5 SAMPLES

A. Office samples shall be of sufficient size and quantity to clearly illustrate:
   1. Functional characteristics of product or material, with integrally related parts and attachment devices.
   2. Full range of color samples.

B. Color Selections & Samples: Provide two (2) samples for the Architect’s review and record. Provide cut sheet when applicable.
   1. Samples for Initial Selection: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer’s product line. Architect will return submittal with options selected. In addition to the physical samples required above, submit a .pdf file of photographs of the actual color samples and identifying labels.
   2. Samples for Verification: Submit two (2) full-size units or Sample of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection. In addition to the physical samples required above, submit a .pdf file of photographs of the actual color samples and identifying labels. Architect will retain physical samples.
      a. After Color Board has been delivered to the project site, submit one (1) sample for verification in lieu of two (2). One will be retained by Contractor for mounting on Color Board after approval by Architect.

C. Field Samples and Mock-ups:
   1. Erect at project site at location acceptable to Architect.
   2. Construct each sample or mock-up complete, including work of all trades required in finish work.
   3. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work.

D. Digital Samples: In addition to the physical Office Samples and Field Samples/Mock-ups, submit a .pdf file of photographs of the actual samples/mock-ups using the “Submittal” feature in the Architect’s project management program (Newforma Info Exchange).

E. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures and patterns, for Architect selection.

F. Submit samples to illustrate functional characteristics of products, including parts and attachments.

G. Approved samples which may be used in the work are indicated in the specification section.

H. Label each sample with identification required for transmittal letter.

1.6 CONTRACTOR REVIEW

A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, quantities and details, manufacturer's catalog numbers and conformance of submittal with requirements of Contract Documents.

B. Coordinate submittals with requirements of work and of Contract Documents.

C. Sign or initial in a rubber-stamped review block format, each sheet of shop drawings and product data and each sample label to certify compliance with requirements of Contract Documents. Notify Architect in writing at time of submittal, of any deviations from requirements of Contract Documents.

D. Do not fabricate products or begin work which requires submittals until return of submittal with Architect acceptance.

E. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect's review of submittals.

F. Contractor's responsibility for deviations in submittals from requirements of contract documents is not relieved by Architect's review of submittals, unless Architect gives specific written acceptance of deviations. Architect will review submittals for general conformance to design intent only.

1.7 SUBMISSION REQUIREMENTS

A. Submit Shop Drawings and Product Data as soon as practicable after award of contract but not later than 30 calendar days before dates reviewed submittals will be needed.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Resubmittal Review: Allow 10 working days for review of each resubmittal.

C. Submit all office samples as soon as practicable but not later than **60 or 20** days after award of contract in order to facilitate color selections and coordination of the various materials. Final color selections and release of shop drawings contingent upon color selection will not be made until all office samples have been submitted, coordinated and approved.
   1. Color Board shall be delivered to the project site after 60 days. Contractor is responsible for updating color board with samples submitted by Contractor and approved by Architect after 60 days.

D. Digital Submittals: Submit to the Architect, or applicable consultant, shop drawings, product data, and samples required by specification sections. Do not submit illegible fax copies nor carbon copies of shop drawings and product data.
   1. The submittals shall be logged in by the General Contractor and tracked using the “Submittal” feature in the Architect’s project management program (Newforma Info Exchange). All submittals shall be submitted in .pdf format.
      a. Submittals 8-1/2" x 11" and/or 11" x 17" and greater than 50 pages: Provide digital copy for the Architect’s records.
      b. Large Format Drawings (larger than 11 x 17): Provide digital copy for the Architect’s records.
   2. Architect will indicate, via markup on each digital submittal, the appropriate action, then return submittal via the Architect’s project management program (Newforma Project Center).
   3. Submittals to be reviewed by consultants shall be submitted to the Architect via Architect’s project management program with a copy simultaneously sent to the applicable consultant. Submittals will be reviewed by the consultant and then delivered/transmitted to the Architect via the Architect’s project management program (Newforma Info Exchange) for his review prior to transmitting them to the contractor. Submittals to be reviewed by the testing lab shall be handled in the same manner.
   4. Color Selections & Samples: Reference “Samples” Article within this specification section.
   5. Submit digital copies of shop drawings to both the Program Manager and the Architect for review. Direct transmittal by the Contractor to the consultant will not be permitted. Submittals will be reviewed by the consultant and then delivered to the Architect for his review prior to returning them to the contractor.

E. Contractor is responsible for the costs associated with the digital delivery of all submittals, and hard copy where required, to the Architect and the Architect's consultants and retrieval of all submittals from the Architect, when necessary.

F. Accompany submittals with transmittal letter containing:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Identification of specification section and submittal numbers.
5. The number of each shop drawing, product data and sample submitted.
6. Notification of deviations from contract documents.
7. Other pertinent data.

G. Submittals shall include:
1. Date and revision dates.
2. Project title and number.
3. Names of Architect, Contractor, subcontractor, supplier and manufacturer.
4. Identification of product or material and specification section number.
5. Relation to adjacent structure, materials or other critical features.
6. Field dimensions, clearly identified as such.
7. Applicable reference standards.
8. A blank space 3" x 4" for Architect's stamp.
9. Identification of deviations from contract documents.
10. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, compliance with contract documents and coordination with requirements of the work. Note: Absence of the Contractor's stamp shall constitute grounds for rejection of the submittal until such time as the submittal has been processed in accordance with this requirement.
11. Other pertinent data required by specifications.

1.8 RE-SUBMISSION REQUIREMENTS

A. Re-submission: For submittals not approved by Architect, make corrections and changes in submittals required by Architect and re-submit until approved.
1. The digital re-submission shall be logged in using the “My Expected Submittals” feature in the Architect’s project management program (Newforma Info Exchange).

B. Shop Drawings:
1. Revise initial drawings and re-submit as specified for initial submittal.
2. Indicate on drawings any changes which have been made, other than those requested by Architect.

C. Product Data and Samples: Submit new data and samples as specified for initial submittal.

1.9 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute reviewed submittal of shop drawings and product data which carry Architect's stamp as follows: Contractor's file, project site file, record documents file, other prime contractors.

B. Keep and maintain a full set of submittals throughout the construction phase to be submitted to the Architect with other Close-out documents for delivery to the Owner for his permanent record. Set of submittals shall be delivered to the Architect in cardboard file boxes with string and button type closures. Organize submittals by CSI divisions, utilizing neatly labeled pressboard dividers to separate the sections. Neatly label short end of box with project name, contents and duration of construction.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 35 00

ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. General: The procedures and administrative requirements of this section apply to all of the sections of the specification which are involved in alterations to the existing building.
2. Extent Notes: Cut into or partially remove portions of the existing buildings as necessary to make way for new construction. Include such work as:
a. Cutting, moving, or removal of items shown to be cut, moved, or removed.
b. Cutting, moving, or removal of items not shown to be cut, moved, or removed, but which must be cut, moved, or removed to allow the new work to proceed. Work or items which are to remain in the finished work shall be patched or reinstalled after their cutting, moving, or removal, and their joints and finishes made to match adjacent or similar work.
c. Removal of existing surface finishes as needed to install new work or finishes.
d. Removal of abandoned items and removal of items serving no useful purpose, such as abandoned piping.
e. Repair or removal of dangerous or unsanitary conditions resulting from alterations work.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work; Sequence of construction and instructions concerning asbestos.
2. Section 01 50 00 - Temporary Facilities and Controls.
3. Section 01 73 29 - Cutting and Patching.
4. Section 01 74 13 - Progress Cleaning.
5. Section 02 41 19 - Selective Structure Demolition.

1.2 SCHEDULING AND ACCESS

A. Maintenance of Access and Operations: During period of construction, do not obstruct in any manner existing exit ways of Owner-occupied areas. Prior to removal of existing exit ways (stairs, corridors, doors) as part of new work, provide and maintain new exit ways so as to maintain same number of exit ways. Maintain existing fire doors in an operable condition.

B. Maintenance of Existing Services:
1. Maintain environmental control in existing buildings, especially temperature, humidity and dust control.
2. Provide temporary lines and connections as required to maintain existing mechanical and electrical services in buildings.
3. Notify Owner a minimum of seven days prior to each required interruption of mechanical or electrical services in buildings. Such interruptions shall be only at such times and for lengths of time as approved by the Owner. In no event shall interruption occur without prior approval of the Owner.

PART 2 - PRODUCTS

2.1 PRODUCTS FOR PATCHING EXTENDING WORK

A. New Materials: As specified in individual sections.

B. Match existing products and work for patching and extending work.

C. Determine type and quality of existing products by inspection and any necessary testing, and workmanship by use of existing as a standard. Presence of a product, finish, or type of work, requires that patching, extending, or matching shall be performed as necessary to make work complete and consistent with existing quality or specifications if more stringent.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that demolition is complete, and areas are ready for installation of new work.

B. Beginning of restoration work means acceptance of existing conditions.

3.2 PREPARATION

A. Cut, move, or remove items as necessary for access to alterations and renovations work; replace and restore at completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, rusted materials, and deteriorated masonry and concrete; replace materials as specified for finished work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Prepare surfaces and remove surface finishes to provide for proper installation of new work and new finishes.

E. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

3.3 INSTALLATION

A. Coordinate work of alterations and renovations to expedite completion.

B. Project shall be complete.

C. Remove, cut, and patch work in a manner to minimize damage and to provide means of restoring products and finishes to specified condition.

D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent new finishes.

E. Install products as specified in individual sections.

3.4 ALTERATIONS, CUTTING, AND PROTECTION

A. Extent:
1. Cutting and removal work shall be performed so as not to cut or remove more than is necessary and so as not to damage adjacent work.
2. Conduct work in such a manner as to minimize noise and to minimize accumulation and spread of dirt and dust.
3. Perform cutting for ductwork and other rectangular openings with carborundum saw with approved dust arrestor.
4. Drill holes for conduit and piping using core drills.

B. Shoring, Bracing, and Capping: Provide shores, needling and bracing as needed to keep buildings structurally secure and free of deflection in all its parts, and as needed for installation of new structural members.

C. Responsibility and Assignment to Trades:
1. Contractor shall assign the work of moving, removal, cutting, patching and repair to trades under his supervision so as to cause the least damage to each type of work encountered, and so as to return the buildings as much as possible to the appearance of new work.
2. Patching of finish materials shall be assigned to mechanics skilled in the work of the finish trade involved.

D. Protection:
1. Protect remaining finishes, equipment, and adjacent work from damage caused by cutting, moving, removal and patching operations. Protect surfaces which will remain a part of the finished work.
2. Protect existing facilities and features, within designated construction limits and along corridor access route to construction area.

3. Cover existing wall and floor finishes in work areas, in adjacent areas, and along corridor access route to prevent damage from product delivery and construction operations. Use reinforced sheeting, listed by Underwriters' Laboratories, Inc., as having a flame spread rating of less than 25 and smoke developed rating of less than 50. Apply double thickness of sheeting, fastened to one side with no-tear fasteners. Tape joints continuously.
4. During demolition, cutting and construction, provide positive dust control by wetting dust debris and by completely sealing openings to Owner-occupied areas with temporary partitions, so as to prevent spread of dust and dirt to adjacent areas.
5. After materials, equipment and machinery are installed, properly protect work until final acceptance.
6. Damage resulting from construction operations shall be repaired by the Contractor without cost to the Owner.
7. During non-working hours, provide continuous security at openings cut into existing exterior walls and roofs.

E. Debris:
1. Remove debris promptly from the site each day. Removed material, except that listed or marked by the Architect for retention, becomes property of the Contractor. Load removed material directly on trucks for removal from site. Do not allow debris to enter sewers.
2. Do not let piled material endanger structure.
3. During cutting and coring operations, use metal lined wood box secured tight against surface, to catch falling debris and water.

3.5 PATCHING, EXTENDING, AND MATCHING

A. Skill: Patch and extend existing work using skilled mechanics who are capable of matching the existing quality of workmanship. The quality of patched or extended work shall not be less than that specified in the sections of the product and execution specifications which follow these general requirements.

B. Patching:
1. In areas where any portion of an existing finishing surface is damaged, lifted, stained, or otherwise made or found to be imperfect, patch or replace the imperfect portion of the surface with matching material.
2. Provide adequate support or substrate for patching of finishes.
3. If the imperfect surface was a painted or coated one, re-paint or re-coat the patched portion in such a way that uniform color and texture over the entire surface results.
4. If the surrounding surface cannot be matched, re-paint or re-coat the entire surface.

C. Quality:
1. In the sections of the product and execution of specifications which follow these general requirements, no concerted attempt has been made to describe each of the various existing products that must be used to patch, match, extend or replace existing work. Obtain such products in time to complete the work on schedule. Such products shall be provided in quality which is in no way inferior to the existing products.
2. The quality of the products that exist in the buildings, as apparent during pre-bid site visits, shall serve as the specification requirement for strength, appearance, and other characteristics.

D. Transitions:
1. Where new work abuts or finishes flush with existing work, make the transition as smooth and workmanlike as possible. Patched work shall match existing adjacent work in texture and appearance so as to make the patch or transition invisible to the eye.
2. Where masonry, or other finished surface is cut in such a way that a smooth transition with new work is not possible, terminate the existing surface in a neat fashion along a straight line at a natural line of division and provide trim appropriate to the finished surface.
3. Where two or more spaces are indicated to become one space, rework floors and ceilings so that horizontal planes, without breaks, steps or bulkheads result.
4. In cases of extreme change of level (3" or more), obtain instructions from Architect as to method of making transition. Either stepping, bulkheading, encasement, ramping, sloping or change of transition line shall be employed, or a combination of these, as directed in each case by the Architect.

E. Matching:
1. Restore existing work that is damaged during construction to a condition equal to its condition at the time of the start of the work.
2. At locations in existing areas where partitions are removed, patch the floors, walls, and ceilings with finish materials to match adjacent finishes.

3. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.6 REPAIR

A. Replace work damaged in the course of alterations, except at areas approved by the Architect for repair.

B. Where full removal of extensive amounts of almost-suitable work would be needed to replace damaged portions, then filling, spackling, straightening, and similar repair techniques, followed by full painting or other finishing, will be permitted.

C. If the repaired work is not brought up to the standard for new work, the Architect will direct that it be cut out and replaced with new work.

3.7 FIRESTOPPING

A. Where existing partitions or walls are penetrated by new work, seal around penetrating conduit or sleeve with approved and listed safing.

3.8 CLEANING

A. In addition to cleaning specified in SECTION 01 74 13 - PROGRESS CLEANING, clean Owner-occupied areas of work daily.

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 CODES

A. Where references are made on drawings or specifications to codes, they shall be considered an integral part of the contract documents as minimum standards. Nothing contained in the contract documents shall be so construed as to be in conflict with any law, bylaw or regulation of the municipal, state, federal or other authorities having jurisdiction.

B. Perform work in compliance with all City of Houston ordinances and requirements.

1.2 GOVERNING LAWS

A. Additional information with legal implications regarding applicable governing laws and jurisdictions can be found in the conditions of the contract.

1.3 PERMITTING

A. Contractor shall, without additional expense to Owner, obtain necessary licenses and permits, and be responsible for complying with any federal, state, county and municipal laws, codes and regulations applicable to the performance of the work, including, but not limited to, any laws or regulations requiring the use of licensed contractors to perform parts of the work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the contract documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the contract documents to the extent referenced. Such standards are made a part of the contract documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the contract documents.

C. Copies of Standards: Each entity engaged in construction on project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the contract documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	800.872.2253 202.272.0080
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterway Experiment Station http://www.erdc.usace.army.mil/	601.634.2355
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.dla.mil	215.697.6257
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point www.dodssp.daps.dla.mil	215.697.6257
	Available from General Services Administration www.gsa.gov	202.501.1021
	Available from National Institute of Building Sciences www.nibs.org	202.289.7800
ICC-ES	ICC Evaluation Services, Inc. www.icc-es.org	800.423.6587 562.699.0543
MIL	See MILSPEC	
MIL-STD	See MILSPEC	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.dla.mil	215.697.6257

TAS	Texas Accessibility Standards P.O. Box 12157 Austin, TX 78711 www.license.state.tx.us/ab/abtas.htm	512.463.3211

1.2 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	703.358.2960
AAMA	American Architectural Manufacturers Association www.aamanet.org	847.303.5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	202.624.5800
ACI	ACI International (American Concrete Institute) www.aci-int.org (www.concrete.org)	248.848.3700
AGA	American Gas Association www.aga.org	202.824.7000
AISC	American Institute of Steel Construction www.aisc.org	800.644.2400 312.670.2400
AISI	American Iron and Steel Institute www.steel.org	202.452.7100
ANSI	American National Standards Institute www.ansi.org	202.293.8020
APA	APA-The Engineered Wood Association www.apawood.org	253.565.6600
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers www.ashrae.org	404.636.8400
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	610.832.9585
AWI	Architectural Woodwork Institute www.awinet.org	571.323.3636
AWPA	American Wood Protection Association www.awpa.com	205.733.4077
AWS	American Welding Society www.aws.org	800.443.9353 305.443.9353
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	212.297.2122
BIA	Brick Industry Association (The) www.gobrick.com	703.620.0010

CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	630.584.1919
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	301.596.2583
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	847.517.1200
DHI	Door and Hardware Institute www.dhi.org	703.222.2010
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	401.275.3000
GA	Gypsum Association www.gypsum.org	301.277.8686
GANA	Glass Association of North America www.glasswebsite.com	785.271.0208
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	703.435.2900
IGCC	Insulating Glass Certification Council www.igcc.org	315.646.2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	613.233.1510
MBMA	Metal Building Manufacturers Association www.mbma.com	216.241.7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	888.480.9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	312.644.6610
MIA	Marble Institute of America www.marble-institute.com	440.250.9222
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	630.942.6591
NCMA	National Concrete Masonry Association www.ncma.org	703.713.1900
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	207.829.6901
NEMA	National Electrical Manufacturers Association www.nema.org	703.841.3200

NFPA	NFPA (National Fire Protection Association) www.nfpa.org	800.344-3555 617.770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	301.589.1776
NHLA	National Hardwood Lumber Association www.nhla.com	800.933.0318 901.377.1818
NLGA	National Lumber Grades Authority www.nlga.org	604.524.2393
NOFMA	National Oak Flooring Manufacturers Association (The Wood Flooring Manufacturers Association) www.nofma.org	901.526.5016
NRCA	National Roofing Contractors Association www.nrca.net	800.323.9545 847.299.9070
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	800.323.9736 540.751.0930
NWWDA	National Wood Window and Door Association (See WDMA)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	312.786.0300
PDCA	Painting and Decorating Contractors of America www.pdca.org	800.332.7322 314.514.7322
SDI	Steel Deck Institute www.sdi.org	847.458.4647
SDI	Steel Door Institute www.steeldoor.org	440.899.0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	516.294.5424
SGCC	Safety Glazing Certification Council www.sgcc.org	315.646.2234
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	843.626.1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	703.803.2980
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	850.434.2611
TCNA	Tile Council of America, Inc. www.tileusa.com	864.646.8453
TPI	Truss Plate Institute, Inc. www.tpinst.org	703.683.1010

UL	Underwriters Laboratories Inc. www.ul.com	800.285.4476 847.272.8800
USGBC	U.S. Green Building Council www.usgbc.org	800.795.1747 202.828.7422
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	800.283.1486 503.639.0651
WDMA	Window & Door Manufacturers Association (Formerly: NWWA - National Wood Window and Door Association) www.wdma.com	800.223.2301 312.321.6802
WI	Woodwork Institute www.woodworkinstitute.com	916.372.9943
WWPA	Western Wood Products Association www.wwpa.org	503.224.3930

B. Code Agencies: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

BOCA	BOCA International, Inc. (See ICC)	
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	909.472.4100
ICBO	International Conference of Building Officials (See ICC)	
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.iccsafe.org	888.422.7233 703.931.4533
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	

C. Federal Government Agencies: Where abbreviations and acronyms are used in specifications or other contract documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the contract documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	800.638.2772 301.504.6816
EPA	Environmental Protection Agency www.epa.gov	202.272.0167
OSHA	Occupational Safety & Health Administration www.osha.gov	800.321.6742 202.693.1999

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 42 16

DEFINITIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. “Furnish": Supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar operations.

B. "Install": Operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

C. "Product": Materials, systems and equipment.

D. “Project Manual”: Volume assembled for the Work which may include the bidding requirements, sample forms, conditions of the contract, and specifications.

E. "Provide": Furnish and install, complete and ready for the intended use.

***** ON PRIVATELY BID PROJECTS *****

F. “Contract Award”: When a contract is delivered to the winning bidder after negotiations have proceeded and agreed upon between both parties.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Quality control of products and workmanship.
2. Contractor’s construction-related professional design services.
3. Contractor’s design-related professional design services.
4. Manufacturer's instructions.
5. Manufacturer's certificates and field services.
6. Mockups.

B. Related Requirements:
1. Section 01 33 23 - Shop Drawings, Product Data, and Samples: Field samples. Submittal of manufacturer's instructions.
2. Section 01 42 00 - References.
3. Section 01 45 23 - Testing and Inspection Services.
4. Section 01 62 00 - Product Options.
5. Individual Specifications Sections: Mockups required.
6. Individual Specifications Sections: Contractor’s professional design services required.

1.2 DESCRIPTION

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship, and site conditions, to produce work in accordance with contract documents.

1.3 DEFINITIONS

A. Contractor’s Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
1. Submit signed and sealed drawings, calculations, specifications, certifications, shop drawings, and other submittals required by individual specification sections. Prepare such deliverables directly by, or under direct supervision of, appropriate licensed design professional in the state the project is located.

B. Design Service Types Required:
1. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.
2. Design-Related: Design services explicitly required to be performed by another design professional due to highly technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design intent of the project.

1.4 WORKMANSHIP

A. Comply with industry standards of the region except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Provide suitably qualified personnel to produce work of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

D. Provide finishes to match approved samples.

1.5 CONTRACTOR’S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Contractor’s professional design services are subject to requirements of project’s Conditions for Construction Contract.

B. Provide such engineering services as may be necessary to plan and safely conduct construction operations and execute portions of the work. Such engineering services may pertain to, but may not be limited to, temporary construction of sheeting, shoring, supports, scaffolding, bracing, falsework, temporary or permanent foundation underpinning, stairs, steps, rigging, and hoisting.

1.6 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections. Submit a Request for Information (RFI) to Architect if the criteria indicated are not sufficient to perform required design services.

C. Refer to individual specification sections regarding the required scope of Contractor's design-related professional design services.

1.7 MANUFACTURER'S INSTRUCTIONS

A. Require compliance with instructions in full detail, including each step in sequence.

B. Should instruction conflict with contract documents, request clarification from Architect/Engineer before proceeding.

1.8 MANUFACTURER'S CERTIFICATES

A. When required in individual Specifications section, submit manufacturer's certificate, in duplicate, certifying that products meet or exceed specified requirements, executed by responsible officer.

1.9 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specifications section, have manufacturer or his authorized representative provide qualified representative to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment test, adjust, and balance of equipment as applicable, and to make written report of observations and recommendations to Architect.

B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report in duplicate within 30 days of observation to Architect/Engineer for review.

1.10 MOCKUPS

A. Tests will be performed under provisions of SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

B. Assemble and erect complete, with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Acceptable mockups in place may be retained in completed work.

1.11 FIELD SAMPLES

A. Install field samples at the site as required by individual specification sections for review.

B. Acceptable samples represent a quality level for the work.

C. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by Architect/Engineer.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 45 23

TESTING AND INSPECTION SERVICES (BY OWNER)

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Included: Owner provided materials testing laboratory services.

B. Related Requirements:
1. Document 00 31 32 - Geotechnical Data.
2. Terms and Conditions: Inspections, testing, and approvals required by public authorities.
3. Section 01 45 00 - Contract Quality Control: Manufacturer's certificates.
4. Section 01 78 39 - Project Record Documents.
5. Individual Specifications Sections: Inspections and tests required, and standards for testing.

1.2 SELECTION AND PAYMENT

A. Owner will employ services of an independent materials testing laboratory to perform specified inspection and testing and will pay for these services directly to the testing laboratory.

B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of contract documents. Contractor will pay all testing required by local authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Laboratory shall comply with requirements of ASTM E 329 and ASTM D 3740 and provide certifications to this effect.

B. Laboratory shall maintain a full-time registered Engineer on staff to review specific tests required by this specification.

C. Laboratory shall be authorized to operate in State in which project is located.

D. Testing equipment shall be calibrated to ensure accurate results and values in order to ensure that test results are true and valid, and at intervals with devices of an accuracy traceable to either NBS Standards or accepted values of natural physical constants.

1.4 LABORATORY RESPONSIBILITIES

A. Provide qualified personnel at site after due notice from the contractor; cooperate with Architect, Contractor, and appropriate public authorities having jurisdiction in performance of services.

B. Perform specified inspection, sampling, and testing of products in accordance with latest, up-to-date standards.

C. Ascertain compliance of materials and mixes with requirements of contract documents.

D. Promptly notify Architect, appropriate consultants, Contractor, Owner, and authority having jurisdiction of observed irregularities or non-conformance of work or products.

E. Perform additional inspections and tests required by Architect, Owner, Contractor, or authority having jurisdiction.

1.5 LABORATORY REPORTS

A. After each inspection and test, promptly submit two copies of laboratory report to Architect, one to applicable consultant, one to Owner, one to Contractor, and one to City. Include: Date issued, project title and number, name of inspector, date and time of sampling or inspection, weather conditions, identification of product and specifications section, location in the project, type of inspection or test, date of test, results

of tests, and specific indication of conformance, or lack of such, with contract documents. When requested by Architect/Engineer, provide interpretation of test results.

1.6 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of contract documents.

B. Laboratory may not approve or accept any portion of the work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop work.

1.7 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing, together with proposed mix designs.

B. Cooperate with laboratory personnel, and ensure ready access to work and to manufacturer's facilities, if requested by testing lab.

C. Provide incidental labor and facilities for access to work to be tested, to obtain and handle samples at the site, or at source of products to be tested, in order to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify laboratory of material sources and furnish lab-determined necessary quantities of representative samples of materials proposed for use which are required to be tested.

E. Notify Architect and laboratory 24 hours prior to expected time for operations requiring inspection and testing services. Cancel notifications in a timely manner if items or systems are not ready for inspection as intended. Reimburse Owner for trip charges when cancellation notifications are not made in a timely fashion.

F. Advise laboratory in a timely fashion to complete required inspection and testing prior to subsequent work being performed.

G. Reimburse Owner for all subsequent re-testing of products or systems found to be defective or otherwise not in accordance with specification requirements, and for any overtime pay required as a result of any inspection requirements that may fall outside of normal job-site weekday work schedule. Remove rejected products or work and replace with products or work of specified quality.

H. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and testing laboratory when the source of any material is changed after the original tests or inspections have been made.

PART 2 - PRODUCTS – Not used.

PART 3 - EXECUTION

3.1 EARTHWORK (SITE GENERAL)

A. Make necessary soil tests (Atterberg Limit Series ASTM D 4318 and ASTM D 698 Standard Proctor) to determine moisture content and density of existing subgrade. Perform necessary soil tests (Atterberg Limit Series and ASTM D 698 Standard Proctor for each type of imported fill) to determine the moisture content and to inspect and test the placement of additional fill lifts to verify that all fill materials used are in accordance with the specifications for that use. Perform one field density test (ASTM D 2922 and ASTM D 3017) per 5,000 sq. ft. of site area in the area affected on each lift prior to placement of additional fill material.

B. Imported Topsoil Tests: Testing for topsoil quality compliance shall be performed by the Testing Laboratory.

3.2 PAVING OR SPECIAL SURFACE SUBGRADE PREPARATION

A. Perform one subgrade in-place density test per 7,500 sq. ft. of subgrade, after subgrade preparation, in accordance with ASTM D 2922 and ASTM D 3017. Perform tests within 48 hours of pavement construction.

B. Pulverization tests on lime subgrade, TEX101E, Part III, at same frequency as density tests.

3.3 BUILDING SUBGRADE PREPARATION

A. Make necessary soil tests (Atterberg Limit Series and ASTM D 698 Standard Proctor for each type of fill) to determine the moisture content and density of existing subgrade and inspect and test the placement of additional fill lifts to verify that all fill materials used are in accordance with the specifications for that use. Perform one field density test (ASTM D 2922 and ASTM D 3017) for each 5,000 sq.ft. of area within the building footprint on each lift prior to placement of additional fill material.

3.4 DRILLED CONCRETE PIERS

A. The independent testing laboratory shall provide the services of their registered geotechnical engineer at the initiation of the on-site pier drilling operations to determine the appropriate bearing material into which the piers are to be founded. Written documentation of the "determination" shall be prepared and forwarded to the Owner, Architect, and Contractor.

B. Make on-site full-time inspections of the pier drilling operation for each pier drilled and placed to verify that the proper strata and penetration, or depth, has been attained, and determine that shafts are properly clean and dry before placing concrete.

C. Maintain a pier log for each pier showing design requirements and actual in place size and depth, in accordance with example noted in Specification SECTION 31 63 29 - DRILLED CONCRETE PIERS.

D. Verify that the excavation is of the proper size and adequately clean and dry.

E. Verify that each shaft is founded at a depth in accordance with the geotechnical report, existing on-site conditions that may be encountered, and at the proper bearing strata.

F. Verify that the reinforcing steel and concrete are properly placed in accordance with other testing provisions specified herein.

G. Notify the Architect and Contractor if soil or water conditions may require casing of piers.

H. Inspection reports of pier drilling shall contain the following:
1. Pier Mark.
2. Pier Depth.
3. Depth of penetration into bearing strata.
4. Plumbness deviation.
5. Description of unusual conditions encountered, including groundwater.
6. Record of deviations from contract document requirements.
7. Other requirements, as defined in SECTION 31 63 29 - DRILLED CONCRETE PIERS.

3.5 FORMWORK, REINFORCING STEEL AND INSERTS

A. Make general inspection of formwork.

B. Prior to each concrete pour, inspect fabrication and bending of bars, bar sizes, spacing, placement and tying in accordance with ACI 315.

C. Prior to each concrete pour, inspect positioning of steel inserts and assemblies, sizes, and spacing, and inspect fusion-welded anchors and sheer connectors.

3.6 CAST-IN-PLACE CONCRETE

A. Design Mixes:

1. At the beginning of the work, Contractor shall submit proposed concrete mixes for review by the Architect, structural engineering consultant, and testing laboratory, including the sieve analysis of fine and course aggregate ASTM C 136, dry rodded weight of coarse aggregate - ASTM C 29, and the specific gravity (bulk saturated surface dry), of fine and coarse aggregates ASTM C 127 and C 128.
2. The testing laboratory will submit their findings to the structural consultant, who will subsequently forward this information, with their review of the submittals, to the Architect.
3. Contractor shall not mix concrete for placing in the work until confirmation laboratory reports are supplied to reflect that each proposed mix will develop the strength required. Successful past history in accordance with ACI 318 will be satisfactory.

B. Test Cylinders: Make at least one test of each day's pouring of concrete or each 100 cubic yards, whichever is the least, on each different portion or section of the work. Mold and cure specimens in accordance with ASTM C 31, and test in accordance with ASTM C 39. Test cylinders shall be made and tested by the laboratory. Footings, walls, and floor systems constitute different sections. Each test shall consist of four specimens, one of which shall be broken at seven days, two at 28 days and one held in reserve. Determine temperature and air content for each set of test cylinders in accordance with ASTM C 231.

C. Field Quality Control:
1. Determine slump for each concrete strength test and whenever consistency of concrete varies, in accordance with ASTM C 143.
2. Monitor and record addition of water to concrete and length of time concrete is allowed to remain in truck.
3. Verify delivery tickets indicating class of concrete, amount of water added during initial batching, and time initial batching occurred.
4. Monitor work being performed in accordance with ACI (American Concrete Institute) recommendations as a standard of quality.
5. Reference SECTION 03 30 00 - CAST-IN-PLACE CONCRETE for additional requirements.

D. Source Quality Control: An independent testing laboratory representative shall periodically inspect and control concrete mixing and loading of transit mix trucks at batch plant at intervals appropriate to monitor quality of material issued on job.

3.7 MORTAR, GROUT, AND MASONRY REINFORCEMENT

A. Coordinate with Owner’s testing laboratory to provide periodic inspection of the following task:
1. As masonry construction begins, the following shall be verified to ensure compliance:
   a. Proportions of site prepared mortar.
   b. Construction of mortar joints.
   c. Location of reinforcement and connectors.
2. The inspection program shall verify:
   a. Size and location of structural elements.
   b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.
   c. Specified size, grade, and type of reinforcement.
   d. Protection of masonry during cold weather (temperature below 40°F.) or hot weather (temperature above 90°F.).
3. Prior to grouting, the following shall be verified to ensure compliance:
   a. Grout space is clean.
   b. Placement of reinforcement and connectors.
   c. Proportions of site-prepared grout.
   d. Construction of mortar joints.

B. Coordinate with Owner’s testing laboratory to provide continuous inspection of the following task:
1. Grout placement shall be verified to ensure compliance with code and construction document provisions.

3.8 STRUCTURAL STEEL

A. Fabrication of, erection of, and connections between, structural steel members, including welding and tension in high strength bolts, will be accomplished under and subject to the inspection of an independent testing agency. The general contractor, structural steel fabricator, and erector shall afford full cooperation to the laboratory.

B. Perform the following testing and inspection: (Prior to placement of steel deck)
   1. Check location of condition of anchor bolts.
   2. Check plumbness and tolerance of steel frame.
   3. Qualification of welders and welding techniques (at Contractor's expense).
   4. Visually inspect common bolts.
   5. Inspection of high-strength bolting:
      a. Visually inspect connections.
      b. Check tightness of at least 33% of connections.
      c. Check at least two bolts of each girder to column connection.
   6. Visually inspect field and shop welds.
   7. Ultrasonic or X-ray testing of full penetration welds.
   8. Re-inspect corrective measures required at expense of Contractor.
   9. Verify that no members are damaged.
   10. Verify that materials and installation are according to contract documents and industry standards.

C. Gas Cutting: Do not use gas cutting torches for correcting fabrication errors in the structural framing. Cutting will not be permitted on any member, unless specifically approved by the structural engineer. Finish gas-cut sections equal to a sheared appearance when gas finish cutting is permitted. Do not flame cut holes or enlarge holes by burning.

D. Correction: The fabricator or erector shall correct deficiencies in structural steel work which inspection and test reports have indicated to be not in compliance with the specified requirements. Perform all additional tests required to reconfirm non-compliance of the original work and to show compliance of corrected work. Retesting of non-conforming work shall be paid by the Contractor.

E. All welders employed during erection of structural steel must be certified by The American Welding Society for type of base materials and positions encountered. Certification testing to be performed at Contractor's expense and copies of Certifications shall be submitted for review upon request and maintained at the project site by the Contractor.

3.9 STEEL JOISTS

A. All steel joists and connections to structural steel members shall be inspected.

B. Quality Assurance: All welding performed during the manufacture and erection of steel joists shall comply with the requirements of AWS D1.1.

C. Inspect condition of joists after erection; check method of attachment to structures and details of bridging and accessories to verify compliance with required standards.

3.10 METAL DECKING

A. Qualification of Welders: Qualify the welding process and all welders (at Contractor expense), and periodically monitor the work in accordance with the requirements of AWS D1.3.

B. Testing Laboratory shall inspect steel decking to ensure the material and installation is in accordance with the specifications and shop drawings.

3.11 METAL DECK AND FIELD WELDED SHEAR STUDS:

A. The erection of metal deck and field welded shear studs shall be subject to inspection by the testing agency.

B. Shear Studs:
   1. Test minimum of two shear studs welded at start of each production period in order to determine generator, control unit and stud welder setting. Studs shall be capable of being bent 45° from vertical without weld failure. If, after welding, visual inspection reveals that sound weld or a full 360° fillet has not been attained for a particular stud, such stud shall be struck with hammer and bent 15° off perpendicular to nearest end of beam. Studs failing under this test shall be replaced.
   2. When the temperature is below 32°F., two studs from each group of 100 studs (or one stud if less than 100 studs are present) should be tested after cooling. Studs shall not be welded below 0°F. or when surfaces are wet with rain or snow. If stud fails in weld, two new studs shall pass test before resumption of welding.

3.12 AIR BARRIER

A. Mock-up Testing: Perform preconstruction testing on field mock-ups. Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
   1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
   2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
   3. Water Penetration Testing: Mockups will be tested for water penetration according to ASTM E 1105.
   4. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate according to ASTM D 4541 (modified).
      a. Use a type II pull tester, except that the membrane shall be cut through to separate the material attached to the disc from the surrounding material.
      b. Perform test after curing period recommended by the material manufacturer.
      c. Record mode of failure and area where the material failed in accordance with ASTM D4541.
      d. The inspection report shall indicate whether the specified adhesion requirement has been met.
   5. Compatibility Determinations: Mockups will be inspected for visual signs of decay, chemical attack, or degradation of any kind. Suspect instances shall be reported to the corresponding manufacturer who shall provide a letter that approves moving forward with the project or rejects the use of the product or rejects the method or circumstances of installation with an appropriate explanation of the position taken.
   6. Notify Architect seven days in advance of the dates and times when mockups will be tested.
   7. Perform the air leakage test and water penetration test of mockups prior to installation of cladding and trim but after installation of all fasteners for cladding and trim, and after installation of other penetrating elements.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Air-barrier dry film thickness.
   3. Continuous structural support of air-barrier system has been provided.
   4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
   5. Site conditions for application temperature and dryness of substrates have been maintained.
   6. Maximum exposure time of materials to UV deterioration has not been exceeded.
   7. Surfaces have been primed, if applicable.
   8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
   9. Termination mastic has been applied on cut edges.
   10. Strips and transition strips have been firmly adhered to substrate.
   11. Compatible materials have been used.
   12. Transitions at changes in direction and structural support at gaps have been provided.
   13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
   14. All penetrations have been sealed.

C. Tests: As determined by Owner's testing agency from among the following tests:
   1. Qualitative Air-Leakage Testing: Test air barrier assemblies for air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization or ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
   2. Quantitative Air-Leakage Testing: Test air barrier assemblies for air leakage according to ASTM E 783.
   3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

3.13 CEMENTITIOUS FIREPROOFING

A. Application inspection to ensure the material and installation is in accordance with the specifications.

B. Sample and verify the thickness and density of spray applied fireproofing in accordance with ASTM E 605 for each day’s application.

3.14 INTUMESCENT FIREPROOFING

A. Perform tests and inspections in accordance with AWCI 12-B and fire-resistance design as required by the IBC and interpret tests and state in each report whether tested work complies with or deviates from requirements.

3.15 FIRESTOPPING

A. Penetration Firestopping: Perform tests and inspections according to ASTM E2174.

B. Joint Firestopping: Perform tests and inspections according to ASTM E2393.

3.16 SMOKE TEST OF DRAINAGE AND VENT PIPING

A. Test to check for joint leakage in the sanitary sewer system and vent system.

3.17 OTHER WORK REQUIRING TESTS

A. Refer to individual sections covered under Divisions 22, 23, and 26 for other work requiring tests by independent testing laboratory.

B. Other Tests:
1. Moisture content in face brick.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 GENERAL

A. Provide temporary facilities and controls needed for the work including, but not limited to those described in the Articles below.

B. Maintain temporary facilities and controls as long as needed for safe and proper completion of the work.

1.2 ACCESS

A. Provide adequate access to and temporary roads to the site of the building if required for the prosecution of the work.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Covered Walkway: Erect a structurally adequate, protective covered walkway for passage of persons entering and exiting building. Coordinate with entrance gates, other facilities and obstructions. Comply with regulations of authorities having jurisdiction.
   1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Architect.

1.3 FIELD OFFICE

A. Provide and maintain a weathertight temporary field office equipped with adequate illumination; with glazed operable windows; with smooth tables for perusal of drawings and specifications; and with metal legal size four-drawer filing cabinet. During cold weather the field offices shall be equipped with a heating device to maintain 65°F. temperature during the work day. During hot weather the offices shall be equipped with an air conditioning device to maintain temperature below 80°F. Provide and pay for fuel and electric energy. In addition to the above listed equipment, provide a space to accommodate the site meetings and have a layout/conference table at 28" height and chairs for 12 people. Upon completion of the project, remove offices from the premises.

1.4 TELEPHONES AND ELECTRONIC COMMUNICATION SERVICE

A. Provide telephones/mobile phones in the field office. Telephone shall be in operation from the commencement of work until the acceptance of the building. Contractor shall pay for installation, maintenance, and removal of telephones, lines and for all use charges.

B. Electronic Communication Service: Provide a computer, printer, high-speed data connection, and internet service as required for the Contractor to maintain internet access and e-mail correspondence.
   1. Contractor shall pay for installation, maintenance, and removal of high-speed data connection and for all use charges.
   2. The Architect's project management system is Newforma Info Exchange, which can be accessed by logging in at the following websites:
      https://infoexchange.vlkarchitects.com/UserWeb/Login/Login.aspx?v=0 OR www.vlkarchitects.com
      Contractor shall utilize this system for all formal and informal correspondence with the Architect and Architect's Consultants, including E-Mails, Requests for Information, Proposals, Submittals, Submittal Transmittals, Meeting Minutes (for regularly scheduled meetings), and Warranty Responses (if warranty items are submitted in the system). In addition, Subcontractor Lists, Project Schedules, Schedule of Values, Pay Applications and other documents requiring submission shall be uploaded in pdf, Word, or Excel format by the Contractor to the appropriate location in Newforma Info Exchange.
   3. While the project management system is very user friendly and easy to learn, Architect will provide informal training for the Contractor as necessary to expedite the Contractor's familiarity with the program.

1.5 TEMPORARY ELECTRICAL SERVICE

A. Existing Building Areas:
   1. At all locations, the Contractor may utilize building electrical power to the extent existing power may be suitable for construction operations. The contractor shall make all tie-ins and shall maintain utility service in all occupied areas. Damage, if any, caused by the Contractor use or tie-ins shall be immediately corrected by the Contractor to as-new conditions. Owner shall pay only the energy charges.
      a. Provide GFCI adapters since existing circuits may not be protected.
   2. The Contractor shall provide and maintain electrical power to points in the building convenient for and available to all trades, including mechanical and other subcontractors, so that power may be secured anywhere in the building with no more than a 100 ft. extension cord. Energy charges for power taken from existing building electrical system shall be paid by the Owner.

1.6 TEMPORARY LIGHTING

A. Provide and maintain temporary lighting inside the building for safe and adequate working conditions throughout all areas where work of any kind is being performed. Provide at least 1/2 watt of incandescent lighting for each square foot of space. Where practical, place temporary lights in the locations where the permanent lighting fixtures are to be installed.

1.7 TEMPORARY HEAT

A. Provide necessary heat during the course of construction, including equipment, fuel and attendance where required. Equipment for temporary heating shall be of a non-smudging type. The permanent heating system may be used for temporary heat, when installed. Upon completion and before acceptance of the building, Contractor shall repair all damage caused by such temporary use and shall clean all filters.

B. When the outside temperature is below freezing, inside of the building shall be kept at or above 40°F. at all times. While painting and finishing are in progress, the temperature shall be kept at or above 60°F. Contractor shall make good all damage caused by insufficient heat.

1.8 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.9 TEMPORARY WATER SERVICE

A. Provide and maintain a temporary water supply during the course of construction and pay meter installation or "tap" fee, if any. Include necessary piping and hose connections. Take precautions to avoid spattering and spilling water in the building. Monthly water usage will be paid by the Owner.

1.10 TEMPORARY SANITARY FACILITIES

A. Provide and maintain adequate sanitary toilet facilities on the project site. The toilet facilities shall meet the requirements of the public authorities having jurisdiction and their use strictly enforced. Sanitary sewer "tap" fee and monthly use fees, if any, shall be paid by Contractor if temporary facilities are connected to city sanitary sewer.

1.11 REFUSE

A. The Contractor shall provide refuse removal service at all times.

1.12 PROTECTIVE FACILITIES

A. Provide and maintain temporary guardrails, handrails and covers for floor, roof and wall openings, vertical shafts and stairways. If movement of the protective facilities is required by a subcontractor to perform his

work, it will be the responsibility of that subcontractor to give prior notification to the Contractor and to replace the protective facilities in a satisfactory manner.

B. Provide and maintain, as per City requirements, fire lane(s) and other required fire protection at the appropriate time and sequence of construction.

1.13 BARRICADES

A. Provide and maintain lighted barricades and fences for the public protection in accordance with requirements of the local city ordinances.

1.14 TEMPORARY FENCING

A. Provide and maintain for the duration of construction a temporary fence of design and type needed to prevent entry onto the work by the public.

1.15 TEMPORARY FIRE PROTECTION

A. Contractor shall provide adequate fire extinguishers on the premises during the course of construction, of the type and size recommended to control fires, which may result from the particular work being performed in accordance with the local fire marshal and fire codes.

B. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition for possible fires.
1. Keep work area free of combustible material.
2. A fire watch consisting of at least one man furnished by Contractor with a fire extinguisher in hand and with no other assigned duties, shall be posted to stand by and observe for potential hazards while welding or cutting is being done. Equip fire watch with suitable personal eye protection and fire extinguishers.
3. At completion of work operations, immediately inspect work and adjacent area for hazards. Re-inspect work for hazards at 1/2 hour and at one hour after completion of welding and cutting operations.

C. No smoking shall be allowed within the building or on the site. Post NO SMOKING signs in areas where work is in progress.

1.16 ENCLOSURES

A. Provide temporary weathertight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. Provide temporary partitions and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, to prevent damage to existing areas and equipment. Construction: Framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; STC rating 35 in accordance with ASTM E 90; flame spread rating of 25 in accordance with ASTM E 84; paint surfaces exposed to view in Owner occupied areas.

1.17 EXISTING ROOF AND STRUCTURE PROTECTION

A. Distribute material, debris, and equipment over the roof deck to avoid damage to the structural deck. Not more than two weeks supply of material shall be stored on a roof at any given time. Place materials and equipment to be stored on the roof as nearly direct over structural members as can be determined. Secure equipment, material, and debris on the roof to prevent movement by wind or other elements. Contractor assumes full responsibility for loading on the structural deck or roofing materials during roof replacement operations.

1.18 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide and operate pumping equipment.

B. Protect site from puddling or running water.

1.19 CLEANING DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish; periodically dispose of off site.

B. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

C. Refer to SECTION 01 74 13 - PROGRESS CLEANING for additional cleaning requirements.

1.20 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary materials, equipment, services, and construction prior to substantial completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2'; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

1.21 PROJECT IDENTIFICATION SIGNS

A. Furnish and erect a project sign, approximately 4' high x 8' long or 6’ high x 6’ long of 3/4" thick exterior grade plywood, in conformance with sign detail supplied by the Architect. Support on posts of framing of treated wood or steel.

B. Furnish and erect Architect logo signs in identical type, size and quantity as General Contractor logo signs. Architect logo signs shall be placed in locations adjacent to all General Contractor signs.

C. Erect sign within 30 days of start of construction and maintain in good condition until completion of project. Sign shall be located as directed by the Architect.

D. No other signs or advertising of any kind, except precautionary warning signs, will be permitted.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 62 00

PRODUCT OPTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for product options and substitutions.

B. Related Requirements:
1. Section 01 31 00 - Project Management and Coordination: Coordination of construction.
2. Section 01 33 23 - Shop Drawings, Product Data, and Samples: Product data submittals.
3. Section 01 42 00 - References: Applicability of specified reference standards.
4. Section 01 78 23 - Operation and Maintenance Data.
5. Section 01 78 39 - Project Record Documents.

1.2 PRODUCT LIST

A. Within 30 days after date of contract, submit to the Architect a list of products and materials which are proposed for substitution per SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1.3 CONTRACTOR'S OPTIONS

A. For products specified only by reference standards, select any product meeting standards, by any manufacturer.

B. For products specified by naming several products or manufacturers, followed by the words "NO SUBSTITUTIONS", select one of the products/manufacturers named.

C. For products specified by naming only one product and manufacturer, there is no option unless a substitution is approved as specified below.

D. For products specified by naming only one product and manufacturer, followed by the words "NO SUBSTITUTIONS", there is no option.

1.4 SUBSTITUTIONS

A. Requests for substitution to material, products, or equipment instead of those specified will be considered if received at least 10 days prior to the bid date. Substitution request received within 10 days of the bid date will be returned without review. Refer to Substitution Request (During the Bidding Phase) form attached to this section.

B. Within 30 days after Notice to Proceed, Architect will consider additional formal requests from the Contractor for substitutions of products in place of those specified. Refer to Substitution Request (After the Bidding Phase) form attached to this section.

C. Submit a separate request for each substitution on a copy of the "SUBSTITUTION REQUEST" form, attached to this section. Include in request:
1. Complete data substantiating compliance of proposed substitution with contract documents.
2. For products:
   a. Product identification, including manufacturer's name and address.
   b. Manufacturer's literature, including product description, performance and test data and reference standards.
   c. Samples, if applicable.
   d. Name and address of similar projects on which product was used and date of installation.
3. For construction methods:
   a. Detailed written descriptions of proposed method.
   b. Complete drawings illustrating methods or revisions.
4. Itemized Comparison of qualities of proposed substitution with product or method specified.
5. Changes required in other elements of work because of substitution.
6. Effect on construction schedule.

D. Request for substitution constitutes a representation that General Contractor or Construction Manager:
   1. Has personally investigated proposed product or method and determined that it is equal to or superior in all respects to that specified.
   2. Will provide same warranties for substitution as for product or method specified.
   3. Will coordinate installation of accepted substitution into the work, making such changes as may be required for the work to be complete in all respects.
   4. Waives all claims for additional cost, under his responsibility and related to substitution, which subsequently become apparent.

E. Substitutions will not be considered if:
   1. They are indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this section.
   2. Acceptance will require substantial revision of contract documents.

F. If substitution is not approved or accepted, Contractor shall furnish specified product or method at no additional cost to the Owner.

G. Acceptance of a proposed substitution prior to the bid date will be in the form of an addendum.

1.5 SUBMITTAL PROCEDURES

A. Submit request for substitution.

B. Architect will review Contractor's requests for substitutions with reasonable promptness.

C. For accepted products, submit shop drawings, product data, and samples under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SUBSTITUTION REQUEST
(During the Bidding Phase)
(Submittal must be received 10 days prior to bid/proposal date)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, custom color/pre-selected color availability, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E/ design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E REVIEW AND ACTION

☐ Substitution approved - Submit bid/proposal based on accepted substitution.

☐ Substitution approved as noted - Submit bid/proposal based on accepted substitution - as noted.

☐ Substitution rejected - Submit bid/proposal for specified materials.

☐ Substitution Request received too late - Submit bid/proposal for specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐_____

SUBSTITUTION REQUEST
(After the Bidding Phase)
(Submittal must be received not later than 30 days after Notice to Proceed)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section No.: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

For finish materials and pre-finished equipment, list the colors available for the specified item and the colors available for the proposed substitution.

☐ Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST - Continued

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Section 01 33 23.

☐ Substitution approved as noted - Make submittals in accordance with Section 01 33 23.

☐ Substitution rejected - Use specified materials.

☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐_____

_____

_____

_____

_____

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Included:
   1. Packaging, Transportation.
   2. Delivery and Receiving.
   3. Product Handling.

B. Related Requirements:
   1. Section 01 32 16 - Construction Progress Schedules.
   2. Section 01 33 23 - Shop Drawings, Product Data, And Samples: Manufacturers' Instructions.
   3. Section 01 66 00 - Product Storage and Handling Requirements.
   4. Individual Sections: Specific requirements for packaging, shipping and handling.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 PACKAGING, TRANSPORTATION

A. Require supplier to package products in boxes or crates for protection during shipment, handling and storage. Protect sensitive products against exposure to elements and moisture.

B. Protect sensitive equipment and finishes against impact, abrasion and other damage.

3.2 DELIVERY AND RECEIVING

A. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation.

B. Coordinate deliveries to avoid conflict with work and conditions at site; limitations on storage space; availability of personnel and handling equipment; and Owner's use of premises.

C. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

D. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

E. Immediately on delivery, inspect shipment to assure
   1. Product complies with requirements of contract documents and reviewed submittals.
   2. Quantities are correct.
   3. Accessories, and installation hardware are correct.
   4. Containers and packages are intact and labels legible.
   5. Products are protected and undamaged.

3.3 PRODUCT HANDLING

A. Provide equipment and personnel to handle products by methods to prevent soiling and damage.

B. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.

C. Handle product by methods to avoid bending or over-stressing. Lift large and heavy components only at designated lift points.

END OF SECTION

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Included:
1. Storage, General.
2. Enclosed Storage.
3. Exterior Storage.
4. Maintenance of Storage.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work.
2. Section 01 50 00 - Temporary Facilities and Controls: Storage facilities. Protection of installed work.
3. Section 01 65 00 - Product Delivery Requirements.
4. Section 01 78 39 - Project Record.

PART 2 - PRODUCTS - Not used.

PART 3 - EXECUTION

3.1 STORAGE, GENERAL

A. Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.

B. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

3.2 ENCLOSED STORAGE

A. Store products, subject to damage by the elements, in substantial weathertight enclosures.

B. Maintain temperature and humidity within ranges stated in manufacturer's instructions.

C. Provide humidity control and ventilation for sensitive products as required by manufacturer's instructions.

D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

3.3 EXTERIOR STORAGE

A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.

B. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.

C. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

D. Provide surface drainage to prevent erosion and ponding of water.

E. Prevent mixing of refuse or chemically injurious materials or liquids.

3.4 MAINTENANCE OF STORAGE

A. Periodically inspect stored products on a scheduled basis.

B. Verify that storage facilities comply with manufacturer's product storage requirements.

C. Verify that manufacturer required environmental conditions are maintained continually.

D. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of contract documents.

3.5 MAINTENANCE OF EQUIPMENT STORAGE

A. For mechanical and electrical equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions shown on exterior of package.

B. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a record document.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements and limitations for cutting and patching of work.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Work by Owner or by separate contractors.
2. Section 01 62 00 - Product Options.
3. Individual Specifications Sections:
a. Cutting and patching incidental to work of the section.
b. Advance notification to other Sections of openings required in work of those sections.
c. Limitations on cutting structural members.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submit written request in advance of cutting or alteration which affects
1. Structural integrity of any element of the 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.

C. Include in request
1. Identification of project.
2. Location and description of affected work.
3. Necessity for cutting or alteration.
4. Description of proposed work and products to be used.
5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate contractor.
7. Written permission of affected separate contractor.
8. Date and time work will be executed.

1.3 PAYMENT FOR COSTS

A. Costs resulting from ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of Architect or other consultants, shall be borne by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products: Those required for original installation.

B. For any change in materials, submit request for substitution under provisions of SECTION 01 62 00 - PRODUCT OPTIONS.

PART 3 - EXECUTION

3.1 GENERAL

A. Execute cutting, fitting and patching including excavation and fill, to complete work, and to
1. Fit the several parts together, to integrate with other work.
2. Uncover work to install ill-timed work.
3. Remove and replace defective and non-conforming work.

4. Remove samples of installed work for testing.
5. Provide openings in elements of work for penetrations of mechanical and electrical work.

3.2 INSPECTION

A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

B. After uncovering, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.3 PREPARATION

A. Provide temporary supports to assure structural integrity of surroundings; devices and methods to protect other portions of project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

C. Maintain excavations free of water.

3.4 PERFORMANCE

A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

B. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

D. Restore work with new products in accordance with requirements of contract documents.

E. Fit work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

F. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated packing material, full thickness of the construction element.

G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

SECTION 01 74 13

CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this section.

B. Related Requirements: In addition to standards described in this section, comply with requirements for cleaning as described in other pertinent sections of these specifications.

1.2 QUALITY ASSURANCE

A. Conduct a daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

3.1 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 the work.
3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the project site.
4. Provide adequate storage for all items awaiting removal from the project site, observing requirements for fire protection and protection of the ecology.

B. Site:
1. Daily, and more often if necessary, inspect the site[s] 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 this section.
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.
   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.

3.2 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 provide by skilled cleaners using commercial quality building maintenance equipment and materials.

B. Prior to completion of the work, remove from the project site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in this section.

C. Site:
   1. Unless otherwise specifically directed by Architect, broom clean paved areas on the site and public paved areas adjacent to the site.
   2. Completely remove resultant debris.

D. 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 structures.
      d. In event of stubborn stains not removable with water, Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
   2. Interior:
      a. Visually inspect interior surfaces 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. This does not apply to resilient flooring surfaces. Reference SECTION 09 65 00 - RESILIENT FLOORING for cleaning of resilient flooring.

E. Special floor/base final cleaning requirements:
   1. Contractor shall coordinate with the Owner’s housekeeping department for preparing the surfaces for final cleaning by the Contractor and protective coatings installed by the Owner.
   2. Protection after final treatment until date of Substantial Completion shall be the responsibility of the Contractor.
   3. All repairs or re-application required as a result of damage caused by the Work shall be the responsibility of the Contractor as directed by the Owner.

F. Schedule final cleaning, as approved by the Architect, to enable the Owner to accept a completely clean work.

3.3 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 for Construction.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for digital project closeout, including but not limited to:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Operating and maintenance data submittal, including training sessions for equipment and systems.
   4. Submittal of warranties.
   5. Submittal of spare parts and maintenance materials.

B. Related Requirements:
   1. Section 01 11 00 - Summary of Work: record drawings.
   2. **S**ection 01 21 00 - Allowances: allowance for indexed electronic archiving of closeout documents**.**
   3. Section 01 33 23 - Shop Drawings, Product Data and Samples.
   4. Section 01 74 13 - Cleaning: final cleaning.
   5. Section 08 71 00 - Door Hardware: keys and keying schedule.

1.2 SUBSTANTIAL COMPLETION

A. General: Substantial Completion is defined in Paragraph 9.8.1 (A201 and A201/CMA) of the General Conditions.

B. Preliminary Procedures: Before requesting inspection for certification of substantial completion, complete the following. List exceptions in the request.
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
      a. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete construction and reasons the work is not complete.
   2. Advise Owner of pending insurance change-over requirements.
   3. Submit specific digital warranties, maintenance agreements, final certifications and similar documents.
   4. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
   5. Submit digital record drawings, maintenance manuals and similar final record information.
   6. Deliver tools, spare parts, extra stock and similar items.
   7. Make final change-over of permanent locks and transmit keys and keying schedule to the Owner. Advise the Owner's personnel of change-over in security provisions.
   8. Complete start-up testing of systems, and training sessions for Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.
   9. Complete final clean-up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

C. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfulfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
   1. Architect will repeat the inspection when requested and assured that the work has been substantially completed.

D. Results of the completed inspection will form the basis of requirements for final acceptance.

1.3 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, submit the following documents, indexed and submitted digitally. List exceptions in the request.
   1. Final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
   2. Updated final statement, accounting for final additional changes to the contract sum.
   3. Certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
   4. Consent of surety to final payment.
   5. Final Liquidated Damages settlement statement.
   6. Evidence of final, continuing insurance coverage complying with insurance requirements.
   7. Evidence of Compliance with Requirements of Governing Authorities
      a. Certificate of Occupancy.
      b. Certificates of Inspection required for mechanical and electrical systems.
   8. Operation and Maintenance Data: Under provisions of SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA.
   9. Warranties and Bonds: Under provisions of SECTION 01 78 30 - WARRANTIES AND BONDS.
   10. Project Record Documents: Under provisions of SECTION 01 78 39 - PROJECT RECORD DOCUMENTS.
   11. Spare Parts and Maintenance Materials: Under provisions of SECTION 01 78 40 - SPARE PARTS, OVERAGES AND MAINTENANCE MATERIALS.
   12. Keys and Keying Schedule: Under provisions of SECTION 08 71 00 - DOOR HARDWARE.
   13. Evidence of Payment and Release of Liens: In accordance with General Conditions of the Contract for Construction.
   14. Evidence of Payment of Debts and Claims: In accordance with General Conditions of the Contract for Construction.
   15. Certificate of Project Compliance: Required under provisions of Texas Administrative Code (TAC), Chapter 61, 1036(c)(3)(F). Form developed by the Texas Education Agency (TEA). See form attached to the end of this Section.
   16. Certification of Asbestos and Lead Free Project: The Contractor shall submit to the Architect a letter addressed to the Owner certifying that no materials used in the construction of this project contain lead nor asbestos materials in excess of amounts allowed by local/state standards, laws, codes, rules and regulations, Federal Environmental Protection Agency (EPA) standards and the Federal Occupational Safety and Health Administration (OSHA) standards, whichever are most restrictive. Certification shall further state that should lead or asbestos fibers be found in this project in concentrations greater than the allowed amounts, that the Contractor shall be responsible for determining which materials contain the lead or asbestos fibers and shall take corrective action to remove those materials from the project at no additional cost to the Owner. Final payment shall not be made until this letter of certification has been received.
   17. Affidavits from all Subcontractors and Suppliers stating that no asbestos products have been installed in this project. The attached “Affidavit of Non-Asbestos, Lead, and PCB Use in Project” form must be notarized.

B. Re-inspection Procedures: Architect will re-inspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been complete, except items whose completion has been delayed because of circumstances acceptable to the Architect.
   1. Upon completion of re-inspection, the Architect will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   2. If necessary, re-inspection will be repeated.

C. Re-inspection Fees: Should status of completion of work require re-inspection by Architect due to failure of work to comply with Contractor's claims on initial inspection, Owner will deduct the amount of Architect and appropriate consultants compensation for re-inspection services from final payment to Contractor. The reimbursement transaction shall be executed by change order to the contract.

1.4 CLOSEOUT PROCEDURES

A. Digital Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Manuals shall be submitted digitally and properly indexed. Also submit one heavy-duty 3-1/2", three-ring vinyl-covered binder, with identification on front and spine of binder. Include the following types of information:
   1. Emergency instructions.

2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn around" cycles.
6. Inspection procedures.
7. Shop drawings.
8. Fixture lamping schedule.

B. Digital Shop Drawings: Keep and maintain a full set of digital submittals throughout the construction phase to be submitted to the Architect with other close-out documents for delivery to the Owner for his permanent record. Set of submittals shall be delivered to the Architect. Organize submittals by CSI divisions.

C. Operating and Maintenance Training Sessions: Prepare a written agenda of items to be covered at each training session. Attendance by Owner's operating and maintenance personnel is mandatory. Notify Owner not less than 48 hours prior to scheduled training sessions.
   1. Arrange for each installer of equipment and systems that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
      a. Maintenance manuals.
      b. Record documents.
      c. Spare parts and materials.
      d. Tools.
      e. Lubricants.
      f. Fuels.
      g. Identification systems.
      h. Control sequences.
      i. Hazards.
      j. Cleaning.
      k. Warranties and bonds.
      l. Maintenance agreements and similar continuing commitments.
   2. Training sessions shall consist of not less than five days of not less than four hours each day. A copy of maintenance manuals for equipment or system being demonstrated shall be on hand during training session. As part of instruction for operating equipment, demonstrate the following procedures:
      a. Start-up.
      b. Shutdown.
      c. Emergency operations.
      d. Noise and vibration adjustments.
      e. Safety procedures.
      f. Economy and efficiency adjustments.
      g. Effective energy utilization.
   3. Training sessions shall be conducted for:
      a. Folding panel partitions / folding glass panel partitions
      b. Food service equipment.
      c. Theatrical lighting control and distribution equipment.
      d. Elevator.
      e. HVAC systems.
      f. Energy management controls.
      g. Public address system.
      h. Fire alarm and smoke detection systems.
      i. ISIMET System.
      j. Irrigation system.
   4. Demonstration and Training DVDs
      a. General: Engage a qualified commercial photographer to record demonstration and training DVDs. Record each training session separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids.
      b. Digital Format: Provide high-quality DVD color recording.
      c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
      d. Narration: Describe scenes by audio narration by microphone while being recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
      e. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from recording opposite the corresponding narration segment.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

CERTIFICATION OF PROJECT COMPLIANCE

Distribution to:

District	___	**Architect/Engineer**	___
Contractor	___	**Texas Education Agency**	___
Other	___	**Building Department**	___

---

1. PRO JECT INFORMATION:
(name, address)

ARCHITECT/ENGINEER:

CONTRACTOR/CM:

PROJECT NUMBER:

CONTRACT DATE:

DISTRICT:

DATE DISTRICT AUTHORIZES 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 enrollment projections, educational specifications and objectives 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 State Board of Education, July 1992, and as provided by the district.

ARCHITECT/ENGINEER: BY: **DATE:**

---

5. The Contractor/CM 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:**

INSTRUCTIONS FOR COMPLETION OF "CERTIFICATION OF PROJECT COMPLIANCE" FORM

Section 1. Identify the following:

– name and address of the school facility
– the Architect/Engineer and Contractor
– the school district's project number (if applicable)
– the date of execution of the construction contract
– name, address, and telephone number of the school district
– the date that the school district authorized the superintendent to hire an architect/engineer
– scope of the project.

Section 2. This section outlines the intent of the document. No action required.

Section 3. This section is to be executed by the school district upon transmittal of the information (as listed) to the architect/engineer and is to remain in the custody of the school district throughout the entire project.

Section 4. This section is to be executed by the architect/engineer upon completion of the plans and specifications and in conjunction with the completion of the plan review for code compliance (ref. 19 TAC §61.104, School Facilities Standards) and returned to the school district's files.

Section 5. This section is to be executed by the contractor upon substantial completion of the project and retained in the school district's files.

Section 6. This section is to be executed by the school district upon acceptance and occupancy of the project.

NOTE: DO NOT SUBMIT THIS DOCUMENT TO THE TEXAS EDUCATION AGENCY. The school district will retain this document in their files indefinitely until review and/or submittal is required by representatives of the Texas Education Agency.

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Digital Manual Only.
   1. Format and content of manuals.
   2. Instruction of Owner's personnel.
   3. Schedule of submittals.

B. Related Requirements:
   1. Section 01 33 23 - Shop Drawings, Product Data, and Samples.
   2. Section 01 45 00 - Quality Control: Manufacturer's instructions.
   3. Section 01 77 00 - Closeout Procedures.
   4. Section 01 78 30 - Warranties and Bonds.
   5. Section 01 78 39 - Project Record Documents.
   6. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.2 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.3 FORMAT

A. Submit operation and maintenance manuals on digital media acceptable to Owner and Architect. Enable reviewer comments on draft submittals.

B. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated Correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of project identify subject matter of contents.

D. Arrange content by systems, under section numbers and sequence of table of contents of this project manual.

1.4 SUBMITTALS

A. Submit copy of preliminary draft or proposed formats and outlines of contents before start of work. Architect/Engineer will review draft and return with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit completed files in final form 15 days prior to final inspection. Files will be returned after final inspection, with Architect/Engineer comments. Revise content of documents as required prior to final submittal.

D. Submit revised volumes of data in final format within 10 days after final inspection.

1.5 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of project; names, addresses, and telephone numbers of Architect/Engineer and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

D. 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.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in SECTION 01 45 00 - QUALITY CONTROL.

F. Warranties and Bonds: Bind in copy of each.

1.6 ELECTRONIC MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental 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 Requirements: As specified in individual specifications sections.

E. Provide a listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.7 ELECTRONIC MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.

C. Include as-installed color coded wiring diagrams.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide as-installed control diagrams by controls manufacturer.

K. Provide Contractor's coordination drawings, with as-installed color coded piping diagrams.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: As specified in individual specifications sections.

O. Provide a listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.8 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. Prepare and insert additional data in operation and maintenance manual when need for such data becomes apparent during instruction.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 01 78 30

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation and submittal of warranties and bonds.
2. Schedule of submittals.

B. Related Requirements:
1. Document Owner’s Competitive Sealed Proposal Documents
2. General Conditions of the Contract for Construction: Performance Bond and Labor and Material Payment Bonds, Warranty, and Correction of Work.
3. Section 01 77 00 - Closeout Procedures.
4. Section 01 78 23 - Operation and Maintenance Data.
5. Section 01 78 39 - Project Record Documents.
6. Individual Specifications Sections: Warranties and bonds required for specific products or work.

1.2 FORM OF SUBMITTALS

A. Bind in three individual heavy-duty 8-1/2" x 11" black, three-ring binders, with hardback, cleanable, plastic covers.

B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of project; name, address and telephone number of Contractor; and name of responsible principal.

C. Table of Contents: Neatly typed, in the sequence of the table of contents of the project manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

D. Separate each warranty or bond with index tab sheets keyed to the table of contents listing. Provide full information, using separate typed sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.3 PREPARATION OF SUBMITTALS

A. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the date of substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

1.4 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.

B. Make other submittals within 10 days after date of substantial completion, prior to final application for payment.

C. For items of work when acceptance is delayed beyond date of substantial completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Maintenance and submittal of record documents and samples.

B. Related Requirements:
1. General Conditions of the Contract for Construction: Documents at the site.
2. Section 01 33 23 - Shop Drawings, Product Data, and Samples.
3. Section 01 77 00 - Closeout Procedures.
4. Section 01 78 23 - Operation and Maintenance Data.
5. Individual Specifications Sections: Manufacturer's certificates and certificates of inspection.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. In addition to requirements in General Conditions, maintain at the site for Owner one record copy of:
1. Contract drawings.
2. Specifications.
3. Addenda.
4. Change orders and other modifications to the contract.
5. Reviewed shop drawings, product data, and samples.
6. Field test records.
7. Inspection certificates.
8. Manufacturer's certificates.

B. Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.

C. Label and file record documents and samples in accordance with section number listings in table of contents of this project manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

D. Maintain record documents in a clean, dry and legible condition. Do not use record documents for construction purposes.

E. Keep record documents and samples available for inspection by Architect.

1.3 RECORDING

A. Record information on a set of opaque drawings, and in a copy of a project manual. All changes made in these drawings in connection with the final construction and installation shall be neatly made in red ink on the prints.

B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

C. Contractor shall include with the record documents, all changes and modifications made by addenda, change orders, supplementary instructions, or other forms of documentation, written or verbal, which alter the documents.

D. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

E. Contract drawings and shop drawings: Legibly mark each item on the drawings to record actual construction, including:
1. Measured depths of elements of foundation in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.

4. Field changes of dimension and detail.
5. Changes made by addenda and modifications.
6. Details not on original contract drawings.
7. References to related shop drawings and modifications.

F. Specifications: Legibly mark each item in the specifications to record actual construction, including:
   1. Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
   2. Changes made by addenda and modifications.

G. Other Documents: Maintain manufacturer's certifications, inspection certifications, field test records, and other documents required by individual specifications sections.

H. Maintain these documents to reflect the current conditions of the work. Changes shall be reviewed on a monthly basis with the Architect's representative. The Contractor's updating of the "installed condition drawings" shall be a prerequisite to the monthly review of the Contractor's payment request by the Architect's representative.

1.4 SUBMITTALS

A. At contract closeout, deliver record documents and samples under provisions of SECTION 01 77 00 - CLOSEOUT PROCEDURES.

B. Transmit with cover letter in duplicate, listing:
   1. Date.
   2. Project title and number.
   3. Contractor's name, address, and telephone number.
   4. Number and title of each record document.
   5. Signature of Contractor or authorized representative.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 78 40

SPARE PARTS, OVERAGES AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements Includes:
   1. Products required.
   2. Storage and delivery of products.

B. Related Requirements:
   1. Section 01 66 00 - Product Storage and Handling Requirements.
   2. Section 01 77 00 - Closeout Procedures.
   3. Section 01 78 23 - Operation and Maintenance Data.
   4. Individual Specifications Sections: Specific spare parts and materials required.

1.2 PRODUCTS REQUIRED

A. Provide quantities of products, spare parts, maintenance tools, and maintenance materials specified in individual sections to be provided to Owner, in addition to that required for completion of work.

B. Products: Identical to those installed in the work. Include quantities in original purchase from manufacturer to avoid variations in manufacture.

1.3 STORAGE, MAINTENANCE

A. Store products with products to be installed in the work, under provisions of SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. When adequate, secure storage facilities are available at site, capable of maintaining conditions required for storage and not required for contract work or storage, or for Owner's needs, spare products may be stored in available space.

C. Maintain spare products in original containers with labels intact and legible, until delivery to Owner.

1.4 DELIVERY

A. Coordinate with Owner: Deliver and unload spare products to Owner at the Owner’s Maintenance Facility and obtain receipt prior to final payment.

B. For portions of project accepted and occupied by Owner prior to substantial completion, deliver a proportional part of spare products to Owner; obtain receipt.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Taking down, cutting away, breaking out and removing portions of the existing building**[s]** to accommodate new construction.
2. Disconnecting, capping and removing identified utilities.
3. Offsite disposal and/or salvaging for reinstallation, indicated components.

B. Related Requirements:
1. Section 01 11 00 - Summary of Work: Instructions concerning hazardous materials.
2. Section 01 35 00 - Alteration Project Procedures: Re-installation of removed materials.
3. Section 01 50 00 - Temporary Facilities and Controls: Barricades; Dust control.
4. Section 01 78 39 - Project Record Documents.

1.2 SUBMITTALS

A. Submit demolition and removal procedures and schedule under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Submit record documents under provisions of SECTION 01 78 39 - PROJECT RECORD DOCUMENTS. Accurately record actual locations of capped utilities and subsurface obstructions.

1.3 PROJECT CONDITIONS

A. Occupancy: Owner will be continuously occupying portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's operations.

B. Existing Conditions: Owner assumes no responsibility for actual condition of items or structures to be demolished. Contractor shall visit the **building[s]** and verify the nature and extent of demolition required. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structures may occur by Owner's removal and salvage operations prior to start of selective demolition.

C. Property Protection: Contractor shall be responsible for the protection of adjoining property, including all parts of the building outside the limits of demolition and site improvements outside the limits of the new construction.

1.4 EXISTING CONDITIONS

A. Conduct demolition to minimize interference with adjacent portion of structures to remain.

B. Conduct operations with minimum interference with Owner's usage of building. Maintain protected egress and access at all times and maintain protected egress at fire exits as required by the Fire Marshall.

1.5 PROTECTION

A. It is essential that there be minimal interruptions of existing mechanical and electrical systems in addition to the normal operation of Owner's facilities.

B. Take care to ensure that there will be no damage to elements or portions thereof which are not required to be removed. Erect and maintain temporary shoring, bracing, and other means to safeguard the structural integrity of the existing portions of building and its parts to remain.

C. Erect and maintain temporary bracing, shoring, lights, barricades, signs and other means to protect workers and other persons, and finishes and improvements to remain from damage; all in accordance with applicable regulatory requirements.

D. Erect and maintain temporary barriers to confine dust and debris.

E. Protect existing trees to remain. Keep area within the drip line clear of construction traffic, parking, soil contamination, soil stockpiling, storage of materials, debris and ponding water.

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials designated for demolition shall become the Contractor's property; remove and dispose of such materials unless otherwise indicated or specified. Sales of salvage materials are not allowed on site.

B. Furnishings and equipment items to remain the Owner's property will be removed by him prior to the start of demolition (or will be designated on the drawings herein or to be removed and stored by Contractor). Items not so designated shall be considered debris and shall be removed and disposed of accordingly.

C. Carefully disconnect, remove and protect items directed by the Owner to be salvaged.

D. Transport salvaged items to on-site storage areas designated by the Owner.

PART 3 - EXECUTION

3.1 INSPECTIONS

A. Prior to starting demolition, make inspection and report observable defects and structural weaknesses of construction designated for demolition, of adjacent structures, and of improvements to remain. If unsatisfactory conditions exist, do not commence demolition until appropriate determinations have been made.

B. Following demolition, make inspection and report defects and structural weaknesses of items partially demolished, cut, or removed, of adjacent structures; and of improvements remaining.

3.2 PREPARATION

A. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.

B. Prevent movement or settlement of adjacent structures. Provide bracing, shoring and underpinning as required.

C. Protect existing appurtenances, structures and landscaping which are not to be demolished.

D. Locate, disconnect, remove and cap designated utility lines within demolition areas.

E. Mark location of disconnected utilities. Identify utilities and indicate capping locations on project record documents.

F. Provide weatherproof closures for exterior openings resulting from demolition work.

3.3 PERFORMANCE

A. Demolition: Carry out the work carefully and in an orderly manner to minimize interference with the daily operations in the building and to avoid damage to permanent parts of the building and the equipment therein. Hold noise, dust and vibration to a minimum. Remove all items and parts so shown and noted on the drawings and as otherwise may be required to be removed to carry out the work.

B. Shoring: Provide temporary shoring for walls and framing wherever present supports are removed or weakened. Any settling or cracking of the existing construction due to the removal of supports and faulty or insufficient shoring shall be the responsibility of the contractor and shall be repaired at no additional expense to the Owner.

C. Material and Equipment Disposal:
   1. The materials and items of equipment which are noted and shown to be salvaged and re-used in new locations or re-used for patching shall be carefully removed and safely stored until ready for reinstallation.
   2. Other items and all debris shall become the property of the Contractor and shall be removed from the premises entirely. Under no circumstances shall debris be allowed to accumulate.

D. Damage: Any existing construction to be left in place which is damaged by the demolition operations shall be refinished or replaced at no additional expense to the Owner. The repair of such damage shall leave the parts in a condition at least equal to that found at the start of the work.

E. Perform demolition in accordance with ANSI A10 - Construction and Demolition Standards, ANSI A10.6 – Safety and Health Program Requirements for Demolition Operations, and applicable regulatory requirements.

F. Remove items designated for demolition within the limits of work indicated and as required to perform the work. Do not remove anything beyond the limits of demolition indicated without the prior written approval of Architect. If in doubt whether to remove an item, obtain written approval prior to proceeding.

G. If in the event hazardous materials (asbestos, PCB's etc.) are encountered during the course of the demolition work, or if it is even suspected that such materials will or have been encountered cease work immediately in the affected area and promptly notify the Owner and Architect.

3.4 CUTTING

A. Make new openings neat, as close as possible to profiles indicated and only to extent necessary for new work.

B. Do not cut or alter structural members unless specifically indicated or approved, and do not damage reinforcing or structural steel to remain.

C. At concrete, masonry, paving and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and -coring equipment. Do not over-cut at corners of cut openings.

D. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.

3.5 PIPES, DUCTS AND CONDUITS

A. Remove deactivated mechanical, plumbing and sprinkler piping, ducts and electrical conduit, including fastenings, connections and other related appurtenances and accessories which would otherwise be exposed in the completed work or interfere with construction operations.

B. These facilities above ceilings may remain in place if their presence does not result in interference with new work, in which case they shall be removed to extent necessary.

C. Cap deactivated piping systems at points of cutoff.

3.6 RECONDITIONING EXISTING SUBSTRATES

A. Clean surfaces on which new materials will be applied, removing adhesives, bitumen and other adhering materials, as necessary to furnish acceptable substrates for new materials.

B. Perform sandblasting, chipping, grinding, acid washing, etching and other work as required by conditions encountered and new materials involved.

C. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing and drying, as applicable.

D. Determine substrate requirements for reconditioned surfaces in cooperation with the manufacturer's representative and installer of each new material involved.

3.7 CLEAN UP

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

END OF SECTION

SECTION 03 11 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Formwork with accessories for the cast-in-place concrete and permanent shoring.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete.
2. Section 03 31 00 - Structural Concrete.
3. Section 07 26 00 - Vapor Retarders.

1.2 SUBMITTALS

A. Product Data: For each of the following:
1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Form ties.
4. Waterstops.

1.3 QUALITY ASSURANCE

A. Standard: Formwork shall meet the requirements of ACI 347.

B. Surface Tolerances: Allowable tolerances for formed concrete surfaces shall be ⅜" maximum in 20 feet for vertical surfaces out of plumb and ¼" maximum in 20 feet for horizontal surfaces out of plane.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Lumber: S2S&CM or S2S&SL No. 3 Boards or better Southern Pine not less than a nominal 1" thick.

B. Plywood: EXT-APA grade-trademarked B-B Plyform, Class I, or High Density Overlaid Plyform, Class I. B-B Plyform shall be sanded but not mill oiled. Plywood shall be new.

C. Fiberboard: Corrugated fiberboard laminated with waterproof adhesive and coated with water resistant compound.
1. Forms in a completely dry condition shall be capable of supporting not less than the following loading without deflection:
a. 1,000 psf for walls/beams 5' or less in height.
b. 1,600 psf for walls exceeding 5' but less than 8' in height.
c. Greater than 1,600 psf for custom designed walls exceeding 8' in height.
2. Fiberboard void forms for beam soffits below grade and slab voids shall be rectangular forms.
3. Fiberboard void forms to correctly void the circular edge of beam soffits to a drilled pier, and slab drops at piers such as ArcVoid and SureRound PierVoid as manufactured by SureVoid Products, Inc., Englewood, CO (phone 888.803.8643 web site: www.surevoid.com).
4. Topping sheet shall be ¼" Masonite.

D. Expansion Joint Filler:
1. Concealed: ASTM D 1751, asphalt saturated cane fiberboard.
2. Exposed: ASTM D 1752, Type I, premolded, non-bituminous, closed cell sponge rubber. Color to be stone gray.

2.2 ACCESSORIES

A. Form Ties: Form ties for exposed concrete surfaces shall be manufactured to allow a positive breakback of at least 1" inside the concrete surface. Ties shall be equipped with a plastic cone or washer not less than 1" in diameter and 1" long which will cover the hole and prevent leakage of mortar. Form ties for unexposed surfaces shall be bolt rods or patented devices having a minimum tensile strength of 3000 pounds when fully assembled. Ties shall be adjustable in length and free of lugs, cones, washers or other features which would leave a hole larger than ⅞" in diameter, or depressions back of the exposed surface of the concrete. Ties shall be of such construction that, when the forms are removed, there will be no metal remaining within 1" of the finished surface of the concrete.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or affect bond of subsequent surface finish manufactured by Nox-Crete, Symons, or approved equivalent.

C. Dovetail Anchor Slots: 24 gage galvanized steel anchor slots with ⅝" throat, 1" deep, furnished with foam or felt fillers to exclude grout seepage.

D. Plastic Waterstops: Multiple rib extruded strips of PVC resin ⅜" thick and 6" wide. Product/manufacturer; one of the following:
Type 5; Grace Construction Products
No. 705; Greenstreak Plastic Products
RB6-38; Vinylex Corp.

E. Chamfer Strips: Extruded plastic triangular chamfer with ¾" face; Burke "CSF-¾", Greenstreak Cat. No. 612.

PART 3 - EXECUTION

3.1 FORMWORK

A. General: Construct forms in compliance with referenced standard. All forms, shores, falsework, bracing and other temporary supports shall be engineered by the Contractor to support all loads imposed during construction, including weight of construction equipment, allowance for live loads and lateral forces due to wind and temporary imbalance of discontinuity of building components.

B. Construction: Construct forms to the dimensions and shapes of the concrete members as detailed and scheduled; and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Set, assemble and brace forms to withstand wet concrete construction loads without deflection, movement, or leakage. Provide access for placing and adjusting reinforcement and cleaning forms.
1. Exposed Surfaces: Form with plywood the non-wearing concrete surfaces exposed to view. On these surfaces locate the form ties in uniform patterns. The joints shall be tight and flush. Plywood may be re-used only with the specific approval of the Architect. Chamfer exposed outside corners.
2. Concealed Surfaces: Form with wood or metal forms the concealed vertical surfaces of grade beams and walls below grade.
3. Metal Anchors: Install dovetail anchor slots in concrete for anchoring masonry facing and partitions to concrete. On concrete wall and beam surfaces which are faced more than 12" high with masonry, place slots vertically and on 24" centers. On concrete columns faced with masonry and where a masonry partition abuts such a column, place a continuous vertical slot in each face of the column as required to secure the masonry.
4. Recesses and Chases: Form for and provide in their proper locations all slots, chases and recesses indicated or implied by the drawings and not formed by sleeves, frames, and other equipment furnished under other sections. The trades requiring such recesses and openings in concrete shall furnish the necessary information for their correct location and placement.
5. Joint Waterstops: Provide continuous waterstops for joints in the concrete walls below grade and in other concrete joints where detailed. Install waterstops with one-half the width encased in the concrete on the first pour and the other half in the second pour. Make end points watertight by fusing with a hot iron. Prefabrication of corners and whole frames is recommended where this is practical.

C. Inserts and Fasteners: Provide for the installation of inserts, conduits, sleeves, drains, hangers, nosings, metal reglets, nailing strips, and like items required for the attachment of other work and furnished by other trades. Properly locate in cooperation with other trades and secure in position before concrete is placed.

D. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.

E. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

3.2 EARTH FORMS

A. Earth forms with neat consistent edges are acceptable at foundation elements unless specified otherwise in geotechnical report.

3.3 REMOVAL OF FORMS

A. Remove forms with sufficient care to avoid scarring exposed surfaces. Prying against face of concrete will not be permitted. Remove forms completely so that no wood form material is left in contact with concrete. Only fiberboard soffit forms may be left in place.
   1. General: Formwork for walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations, but in no event before concrete is 24 hours old. Formwork for beam soffits and other parts that support the weight of concrete shall remain in place until the concrete has reached its specified 28-day strength unless otherwise permitted. When shores and other vertical supports are so arranged that the form facing material may be removed without loosening or disturbing the shores and supports, the facing material only may be removed at an age of 24 hours. Whenever the formwork is removed during the curing period, the exposed concrete shall be cured.
   2. Re-shoring: When re-shoring is permitted or required, the operations shall be planned in advance and shall be subject to review. Re-shoring for the purpose of early form removal shall be performed so that at no time will large areas of new construction be required to support their own weight. While re-shoring is under way, no live loads shall be permitted on the new construction. Re-shores shall be tightened to carry their required loads, but they shall not be over-tightened so that the new construction is over-stressed. Re-shores shall remain in place until the concrete has reached its specified 28-day strength and while weights or loads in excess of design live loads are imposed.
   3. Permanent shoring shall not be removed.

3.4 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

B. Do not reuse wood formwork more than three times for concrete surfaces to be exposed to view. Do not patch formwork.

3.5 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Reinforcement with accessories for the cast-in-place concrete.
2. Reinforcing steel bars and welded steel wire fabric for cast-in-place concrete.
3. Support chairs, bolsters, and spacers, for supporting reinforcement.

B. Related Sections:
1. Section 03 11 00 - Concrete Forming and Accessories.
2. Section 03 30 00 - Cast-in-Place Concrete.
3. Section 04 20 00 - Masonry Units: Reinforcement for masonry.
4. Section 07 95 00 - Expansion Control: Expansion joint cover assemblies.
5. Section 31 63 29 - Drilled Concrete Piers.

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Drawings shall show the size, length, form and position of bar reinforcing and accessories.

B. Certification: Submit a letter certifying that reinforcing bars comply with specified standard for grade.

1.3 QUALITY ASSURANCE

A. Standard: Reinforcement shall meet the requirements of ACI 318 Building Code Requirements for Structural Concrete.

1.4 DELIVERY AND STORAGE

A. Stack reinforcing steel in tiers and mark so that each length, size, shape and location can be readily determined. Exercise care to maintain reinforcement free of dirt, mud, paint or rust.

B. Store materials and accessories on dunnage and under protective sheeting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60 deformed billet steel.

B. Reinforcing Fabric: ASTM A 1064, welded steel wire fabric in flat sheets.

C. Tie Wire: 16 gage annealed steel wire.

D. Accessories: Anchors, dowels, spacers, chairs, bolsters and other devices for supporting and fastening reinforcement and normally considered as accessories to the concrete work. Chairs and bolsters resting on forms for concrete ceiling and soffit surfaces exposed to view shall be plastic tipped.

2.2 FABRICATION

A. Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.

B. In case of fabricating errors, do not straighten or re-bend reinforcement in a manner that will weaken or injure the material.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Placing Steel:
1. Place reinforcement in accordance with CRSI "Placing Reinforcing Bars" and ACI 318, with provisions of ACI 318 governing.
2. Assemble reinforcing steel in the forms, wired and fastened securely. Bending shall be done cold. Bars with kinks or bends not detailed shall be rejected.
3. Clean reinforcing steel of loose rust, mill scale, grease, dirt and other coatings which will reduce or destroy bond with the concrete. A thin film of tight rust will not be objectionable.
4. Position, support, and secure reinforcement to resist displacement by formwork, construction, and concrete placing operations.
5. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers.
6. Place reinforcement to obtain minimum coverages for concrete protection.
7. Arrange, space, and securely tie bars and bar supports together with the specified tie wire.
8. Set wire ties so twisted ends are directed away from exposed concrete surfaces.
9. Support reinforcement and fasten together to prevent displacement by construction loads of placing concrete. Use No. 16 gauge black annealed wire at all joints and crosses to accurately position reinforcement in place.
10. Over formwork, use metal or plastic bar chairs and spacers to support reinforcement.
11. Where concrete surface will be exposed to weather in finished structure, use non-corrosive or corrosion protected accessories within ½" of concrete surface.
12. Where successive mats of reinforcing fabric are continuous, overlap welded wire fabric so that overlap measured between outermost cross wires of each fabric sheet is not less than spacing of cross wires plus 2".
13. Bars having splices not shown on shop drawings will be subject to rejections.
14. Do not bend reinforcement after being embedded in hardened concrete.
15. Do not allow bars to be in contact with dissimilar materials.

3.2 FIELD QUALITY CONTROL

A. Inspection and Evaluation: The testing and inspection laboratory shall inspect placement of all reinforcing steel to confirm compliance with the contract documents.

B. Concrete shall not be poured without inspection approval as noted above.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cast-in-place concrete, including mixing, placing, and finishing.

B. Related Sections:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 03 11 00 - Concrete Forming and Accessories.
3. Section 03 20 00 - Concrete Reinforcing.
4. Section 03 35 35 - Sandblasting.
5. Section 07 26 00 - Vapor Retarders.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Submit product data for admixture, bonding compound, curing compound, grout, and sealer.

C. Design Mixes:
1. At the beginning of the work, Contractor shall submit proposed concrete mix designs for review by the Architect, structural engineering consultant, and testing laboratory per SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
   a. Include the sieve analysis of fine and coarse aggregate ASTM C 136, dry rodded weight of coarse aggregate - ASTM C 29, and the specific gravity (bulk saturated surface dry), of fine and coarse aggregates ASTM C 127 and C 128.
   b. State admixture used and project conditions required for specific admixtures.
   c. Proposed concrete mix design shall also include the results of compressive tests.
2. Contractor shall not mix concrete for placing in the work until confirmation laboratory reports are supplied to reflect that each proposed mix will develop the strength and slump required. Successful past history in accordance with ACI 318 will be satisfactory.

1.3 QUALITY ASSURANCE

A. Standard: Concrete shall meet the requirements of ASTM C 94.

B. Perform work in accordance with ACI 301, 304, 305, 306, and 309.

C. Obtain materials from same source throughout the work.

D. Batch plant shall be able to show a minimum of five-years' experience in batching concrete. If required, they shall furnish a list of similar sized jobs or special condition jobs performed during the last two-years.

E. Surface Tolerances: For all finished concrete wearing surfaces, the variation from level or from elevations indicated shall not exceed ¼" in 16'. If variations exceed those as set forth then the wearing surface shall be filled or ground down as required to meet the stated tolerances.

1.4 PROJECT CONDITIONS

A. Environmental Requirements:
1. Cold Weather Placing: Do not place concrete when the temperature is below 40°F. or is expected to fall below 40°F. within 24 hours after placing concrete; unless either favorable weather is forecast or adequate arrangements for protection and heating have been made in accordance with ACI 306.

2. Hot Weather Placing: Do not place concrete when hot weather conditions exist that would impair the quality and strength of concrete, i.e. any combination of high air temperature, low relative humidity, and wind velocity, unless adequate arrangements for protection have been made in accordance with ACI 305.

B. Coordination: Notify other trades and contractors well in advance of placing concrete to allow them sufficient time in which to install work which is to be built-in or cast into the concrete.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cements: ASTM C 150, Type I, domestic manufacture.

B. Fine Aggregate: ASTM C 33, washed sand with a fineness modulus of between 2.50 and 3.00.

C. Coarse Aggregate: ASTM C 33, clean crushed stone or washed gravel. The nominal maximum particle size shall not exceed 1/5 of the narrowest dimension between forms or ¾ of the minimum clear spacing between reinforcing bars.

D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures, equal to Master Builders "MasterAir AE 200", Master Builders Solutions, a brand of MBCC Group.

F. Fly Ash - ASTM C 618, Type C or Type F, Fly ash may be used at contractor’s option. Limit fly ash content to not-to-exceed 25% of cement content by weight.

G. Water: ASTM C 1602; Clean and potable.

2.2 CONCRETE TREATMENT PRODUCTS

A. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements. Product/ manufacturer; one of the following:
Sikadur 32, Hi-Mod; Sika Chemical
Sealtight Rezi-Weld 1000; W.R. Meadows, Inc.
MasterInject 1000; Master Builders Solutions, a brand of MBCC Group.

B. Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, clear, acrylic copolymer based liquid for curing and sealing concrete. Product/manufacturer; one of the following:
Safe-Cure Clear; ChemMasters ClearDR
Diamond Clear VOX; Euclid Chemical Co.
Cure & Seal 1315 LVOC; Symons Corp., a Dayton Superior Co.
Vocomp-20; W.R. Meadows, Inc.

C. Concrete Sealer at Interior Exposed Concrete: Provide Sealtight Vocomp-25 Acrylic Concrete Sealer as manufactured by W.R. Meadows, Inc., Fort Worth, Texas (phone 817.834.1969).

D. Concrete Sealer at Exterior Exposed Concrete: Provide Sealtight Tiah Acrylic Concrete Sealer as manufactured by W.R. Meadows, Inc., Fort Worth, Texas (phone 817.834.1969).

E. Non-metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, non-metallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and 30-minute working time. Product/manufacturer; one of the following:
   NS Grout; Euclid Chemical Co.
   Sealtight 588 Precision Grout; W.R. Meadows, Inc.
   Sonogrout® 10K; Master Builders, a BASF Chemical Company

F. Re-surfacing and/or Self-Leveling Underlayment Material: Provide Ardex K-15 as distributed by Ardex, Inc. (phone 888.512.7339, www.ardex.com) or Super Flo-Top as manufactured by The Euclid Chemical Co.

2.3 SELECTING PROPORTIONS FOR CONCRETE

A. Strength: Select proportions for a mix designed to produce concrete with a minimum 28-day compressive strength of 3000 psi, unless noted otherwise.

B. Admixture:
   1. Use admixture in all concrete. Select the type (normal, retarder, or high early) best suited for the temperature conditions at the time the concrete is placed and finished.
   2. Use water reducing admixture only with the permission of the Engineer. Do not use water reducing admixture and air entrainment together with any slabs to receive a hard trowelled finish. Use air entrainment in all concrete to be pumped (5%).

C. Use air-entraining admixture in all exterior concrete, including pavement and flatwork. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content by volume with a tolerance of plus or minus 1½ percent within the following limits:
   1. 3 to 6 percent, 1½" max. aggregate.
   2. 3.5 to 6.5 percent, 1" max. aggregate.
   3. 4 to 8 percent, ¾" max. aggregate.
   4. 5 to 9 percent, ½" max. aggregate.

D. Calcium chloride shall not be used.

E. Slump: Select proportions to produce concrete with the following maximum allowable slumps. The slump limits given shall apply after inclusion of the admixture.

Reinforced piers, footings	5"
Reinforced walls, beams, slabs	6"
Pavement, flatwork	4"

2.4 MIXING AND DELIVERY

A. Measurement of concrete materials, mixing, and delivery of fresh concrete to the project shall meet the requirements of ASTM C 94. Transit-mixed concrete supplier shall have a plant with sufficient capacity and transportation facilities to assure continuous delivery at the rate required.

B. Mix concrete in accordance with ASTM C 94, Alternative No. 2, or ACI 304.

C. Deliver concrete in accordance with ASTM C 94.

D. Select proportions for normal weight concrete in accordance with ACI 301 Method 1. Mix not less than one minute after materials are in mixer.

E. Do not transport or use concrete after 90 minutes has expired from time of initial mixing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before any concrete is placed, the forms and reinforcement shall be inspected by the Contractor and the Owner’s testing laboratory. Notify the Owner’s testing laboratory not less than one working day before concrete is scheduled to be placed. Bucks, sleeves, anchors and other fixtures to be embedded in concrete shall be properly positioned and anchored. Wash down form surfaces to remove foreign substances. Provide elevated runways clearing steel and other embedded work.

B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions.

C. At locations where new concrete is doweled to existing work, drill over-sized holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.

3.2 CONVEYING CONCRETE

A. Convey concrete to the place of final deposit by methods which will prevent the separation or loss of the ingredients. Equipment for chuting, pumping, and pneumatically conveying concrete shall be such as to assure a continuous flow of concrete at the delivery end without separation. The use of aluminum chutes or pipes for transporting concrete will not be permitted.

3.3 PLACING CONCRETE

A. Notify Architect and testing laboratory a minimum of 24 hours prior to commencement of concreting operations.

B. General: Place concrete in continuous horizontal lifts no deeper than 24". Avoid inclined lifts and inclined construction joints and do not cause or allow concrete to flow horizontally in the forms. Keep conveying equipment clean and free of hardened concrete. Use tremies or suitable chutes for placing concrete in high narrow walls so that concrete will not have a free vertical fall in excess of 3'.

C. Place concrete in accordance with ACI 301 and as specified below:
   1. Unless protection is provided, do not place concrete in rain, sleet, or snow.
   2. Regulate rate of placement so concrete remains plastic and flows into position.
   3. Deposit concrete continuously until panel or section is completed. Place as near as possible to its final location; do not rehandle.
   4. Do not place concrete, under any circumstances, except in presence of testing laboratory.
   5. When placing concrete in masonry, exercise extreme care to prevent concrete from staining face of masonry.
   6. Consolidation
      a. Comply with requirements of ACI 309.
      b. Use mechanical vibrating equipment for consolidation.
      c. Do not use vibrators to transport concrete in forms.
      d. Use vibrators with sufficient speed and amplitude to consolidate effectively.
      e. Keep a spare vibrator on site during all concrete pours.
      f. Thoroughly consolidate concrete and work around reinforcement, embedded items and into corners of forms. Thoroughly consolidate layers of concrete with previous layers.
   7. Expansion Joint Fillers: Place pre-molded expansion joint fillers at locations as detailed and whenever required to separate site paving from building slabs. Refer to Drawings for required joint dimensions. Reference SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES for joint filler products.
   8. Bonding: Before depositing any new concrete on or against previously deposited concrete which has partially or entirely set, thoroughly roughen and clean the surfaces of the latter of all foreign matter, scum, and laitance. Re-tighten forms and re-coat the surface of the previously deposited concrete with specified bonding agent per manufacturer's directions.

D. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

E. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

F. Saw cut control joints at an optimum time after finishing. Use 3/16" thick blade, cutting ⅓ into depth of slab thickness.

G. Separate exterior slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within ¼" of finished slab surface.

H. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

I. Maintain record of concrete placement. Record date, location, quantity, air temperature and test samples taken.

J. Beams and Walls: Place beams and walls continuously where possible. Start placing at ends of section and progress toward the center. Do not place concrete in beams and walls supported on piers until the concrete in the piers is no longer plastic.

K. Slabs: Place each slab in one continuous operation without joints within the area established for a continuous pour. Start placing at the far end of the area and place each load of concrete against previously placed concrete, not away from it.

L. Drains: Check the setting of floor drains so that they will finish flush with floor surfaces without varying the intended elevations and slopes. Slope surfaces down to drains at least ⅛" per foot or as shown.

M. Compaction: Compact concrete with ramming and spading tools during placing to work the coarse aggregate away from the forms and to produce a dense mass without air pockets. Work concrete through and around reinforcing steel. Do not disturb any embedded work.

N. Consolidation: Use high frequency mechanical vibrators to consolidate concrete and eliminate lift lines in walls exposed to view. Vibrators shall be operated by skilled mechanics under close supervision. Insert and withdraw the vibrator heads at points from 18" to 30" apart for short periods. Do not allow heads to touch the forms.

O. Leveling: Level and grade the top surface of slabs with straight edges over gauge strips. Level the top of foundations for the reception of subsequent work. Level and line steps in like manner over strips or forms. Remove wood spreaders, block, and screeds as the concrete is placed and before it sets.

P. Construction Joints: Generally, locate construction joints in beams and suspended slabs in the middle third of the span. Form each construction joint with a vertical bulkhead. Remove the bulkhead as soon as the concrete has attained its initial set and leave the surface rough. Before placing fresh concrete against the surface, coat the surface with bonding compound applied in conformance with the manufacturer's instructions.

Q. Loading: Do not shake or move the forms and reinforcement nor place any strain on projecting metal after the concrete has taken its initial set. Do not permit loading or traffic of any kind on the construction until the concrete has fully hardened.

R. Hot Weather Placement: Take special care to prevent high temperatures in the fresh concrete during hot weather. Use a set-retarding type admixture to assure that concrete remains workable and lift lines will not be visible. For flatwork use a spray-on evaporation retardant as needed during finishing operations.

S. Mechanical equipment pads required in mechanical yard shall be 6" thick with #4 @12" o.c. each way in mid-slab. Pour pad 6" larger than equipment all around. Additionally provide a continuous poured-down edge beam around the pad 18" deep by 10" wide reinforced with 2-#5 continuous in bottom of beam with #3 ties @ 24" o.c. Add intermediate beams, same size and reinforcing, if pad exceeds 12'-0" in either direction and every 12'-0" thereafter. Provide 4" thick sand bed under slab. Top of slab elevation shall be 3" above finish grade around pad.

T. Construction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade with inserts ¼" wide by ¼ of slab depth. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris. If joint pattern is not shown, provide joints not exceeding 15' in either direction and located to conform to bay spacing wherever possible.

3.4 CORRECTING DEFECTIVE CONCRETE

A. Examine concrete for defects as the forms are removed. Concrete out of alignment or with defective surfaces shall be considered as not conforming to the intent of these specifications. Such concrete shall be removed from the project site unless the Architect grants permission to patch the defective area.

B. Concrete that does not attain the specified 28-day strength shall be removed from the project site at the contractor's expense.

C. Formed surfaces exposed to view shall not have fins, offsets, voids, and bulges. Minor grain marks will not be objectionable, but the texture shall be uniform. Leave corners and other details sharply defined and surfaces straight and true.

D. Repair honeycomb, pour joints, stone pockets, and like imperfections by wetting and pointing with mortar to match adjacent concrete. Where unacceptable surface blemishes occur on concrete exposed to view, rub the entire surface to produce a uniform appearance throughout.

3.5 FILLING TIE ROD AND BOLT HOLES

A. Fill solidly with stiff cement grout the holes in concrete resulting from the removal of bolts and rods. Strike off flush any excess mortar at the faces of the holes. In concrete exposed to view, holes shall be patched with mortar to match adjacent concrete.

3.6 CONCRETE TOPPING

A. Concrete Toppings: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 3000 psi at 28 days.
   2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
   3. Slump Limits: 5 inches, plus or minus 1 inch.
   4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

B. Delay installation of concrete toppings at entrances to insure that finished surfaces will not be stained nor damaged by subsequent construction activities. Remove and re-installed stained or damaged concrete toppings at entrances as directed by Architect.

3.7 CONCRETE FINISHING

A. Rubbed Concrete Finish
   1. Exposed non-wearing concrete surfaces noted to be "Rubbed Concrete" shall be given a rubbed finish.
      a. Remove the forms as soon as possible and while the concrete is still "green". Level offsets and fins, and repair surfaces.
      b. Wet surfaces and rub with a carborundum brick or other suitable abrasive to obtain a uniformly textured and colored finish. Flush the surfaces with clean water to remove slurry and loose particles.
      c. After the rough work on the building has been completed, again rub the surfaces with a carborundum brick. For this rubbing use a slurry made from a patching and repairing compound equal to "Pave-Crete." Apply the slurry and rub it thoroughly into the concrete to provide the desired finish. Remove surplus slurry with burlap before it hardens.
      d. The finished work shall be free of holes and other unsightly defects and shall be uniform in texture and color. Leave corners sharply defined and surfaces straight and true.

3.8 CONCRETE FLOOR, SLAB, AND TOPPING FINISHES

A. Steel Trowel: For concrete floor surfaces to be left exposed, to receive resilient tile, or carpet, provide a standard integral trowel finish. This finish is required on all concrete wearing surfaces for which other specific finishes are not indicated or scheduled.
   1. Strike the surface at the finish floor elevation, and roll and tamp the concrete to force aggregate away from the surface. Screed to a true, level surface except where slopes are specifically indicated, and float when hard enough to support knee boards.
   2. Bring the surface to a true grade by cutting down high spots and filling low spots with fresh concrete. Test with a 16 ft. straight edge, or shorter in restricted areas, and limit surface variations to not more than ¼" in 16'.
   3. Finish the floor with a steel trowel to a smooth dense surface. When hard enough to ring under the trowel, burnish the surface to the final polished finish.

B. Smooth: Concrete slab surfaces to be covered with thinset ceramic tile shall receive steel trowel finish, except that the second burnish troweling shall be omitted. Leave surfaces with some "tooth" for a bond.

C. Rough: Concrete slab surfaces to be covered with quarry and ceramic tile shall be roughened for bond by scrubbing with stiff brooms to exposed the aggregate before laitance has hardened. Sweep the surfaces to remove loose material.

D. Brush: Provide a texture finish for exterior concrete except where scheduled otherwise. After floating and an initial troweling, go over the surfaces with a soft bristle brush or broom to produce a fine textured non-slip finish. Exposed vertical surfaces and corners shall be tooled and troweled smooth.

E. Float: Concrete slab surfaces to be covered with membrane waterproofing and with insulation board, or slabs with sloped surfaces, shall be screeded and floated to a true, relatively smooth finish without sharp projections, offsets and other irregularities.

F. Architectural Concrete Finish (cast-in-place concrete counters): Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part Portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add Portland cement in amounts determined by trial patches so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whites, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours. Horizontal and vertical surfaces shall be smooth and without voids, holes, depressions, and other imperfections.

3.9 CURING

A. Cure all concrete at least 7 days. All curing procedures shall prevent evaporation of moisture from the concrete for the full curing period. Protect surfaces from traffic damage until the curing is complete.

B. Keep exposed vertical surfaces and the tops of beams and walls moist by spraying with water or covering with saturated burlap, starting as soon as the surfaces will resist erosion.

C. Concrete surfaces to be covered with thinset flooring materials (ceramic tile, vinyl composition tile, etc.), shall be cured by covering with reinforced 2-ply paper or 4 mil thick polyethylene sheeting laid with joints lapped 3" and sealed with tape. Do not use curing compound on these surfaces.

D. Coat other concrete wearing surfaces with the curing and sealing compound, using at least 1 gallon per 300 sq. ft. Areas damaged by traffic or subsequent construction operations shall be re-coated.

3.10 FIELD QUALITY CONTROL

A. Acceptance Tests:
1. Samples for strength tests of concrete shall be taken from each 75 cu. yds., or fraction thereof, of each mix design of concrete placed in any one day.
2. Sampling procedures shall meet the requirements of ASTM C 172. If concrete is being pumped, take concrete samples for testing at the point of placement and not at the mixer discharge.
3. Make and record a slump test on each sample. The method of test shall meet the requirements of ASTM C 143.
4. Make 4 cylinders from each sample for strength tests, 1 for 7-day, 2 for 28-day test, and 1 in reserve. The cylinders shall be made on the project site by an Independent Testing Laboratory and shall be cured and tested in conformance with the requirements of ASTM C 31 and C 39.
5. Samples for 3-day strength tests may be taken at the Contractor's discretion and at the Contractor's expense.
6. Samples for temperature and slump tests of concrete shall be taken from each truck, of each mix design of concrete placed in any one day.
7. Testing lab representative shall be on site at all times during concrete pours.
8. No water shall be added to concrete mix on project site without approval from Owner's Testing Laboratory.
9. Concrete delivery tickets for all trucks shall be given to General Contractor for later submission to Owner. Delivery tickets shall record time truck left plant, time truck arrived at site and mix design number being delivered. A maximum of 90 minutes will be allowed from mixing of concrete to delivery.

B. Evaluation of Test Results:
1. Each strength test result shall be the average of 2 cylinders from the same sample tested at 28 days.
2. Strength of each concrete mixture will be satisfactory if the average of any 3 consecutive compressive-strength tests equals or exceeds the specified compressive strength and no individual strength test value falls below specified compressive strength by more than 500 psi.
3. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that compressive strengths or other requirements have not been met. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work.

C. The cost of testing service shall be per SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

3.11 GROUTING

A. Grout base plates and other structural members. Pea gravel may be added to the grout if the space to be grouted is 1" thick or more. Do not add sand to the grout.

3.12 BASE PLATE ANCHOR BOLTS

A. Set the anchor bolts for steel base plates. Use templates.

3.13 PATCHING

A. Patch and repair existing concrete to restore smooth, uniform surfaces.

B. Prepare the surfaces by removing loose and faulty material down to firm concrete. Edges of concrete exposed to view shall be saw-cut straight and square. Brush the surfaces free of dirt and debris and flush down with clean water. After the surfaces are dry, coat them with bonding compound used in conformance with the manufacturer's instructions.

C. Major patching and deep fills shall be done with a mixture of 1 part Portland cement, 1½ parts sand, and 1½ parts pea gravel. Work and tamp the fill into place, screed the surface and float and trowel to a smooth finish. Cure as specified above.

D. Minor patching and re-surfacing of concrete to be covered with tile and carpet shall be done using a suitable re-surfacing material such as Ardex K-15 or Super Flo-Top, which can be carried to a feather edge. Mix and apply in conformance with the manufacturer's instructions and finish to a smooth surface.

3.14 SEALING EXPOSED CONCRETE FLOORS

A. Immediately prior to completion of the building, clean exposed concrete floors to remove dirt, stains, paint, oil and grease. Coat the clean, dry surfaces with sealing compound. Application shall conform to the manufacturer's instructions. Do not allow to puddle.

3.15 PROTECTION AND CLEAN UP

A. Floor Protection: All concrete floors which will be exposed to view in the completed building shall be covered with reinforced paper with joints lapped and sealed. Maintain the protective covering until all wet work in the building (masonry, plaster, and tile) is completed.

B. Clean Up: Excess concrete and wash water from concrete truck drums shall not be dumped anywhere on the site or on adjoining streets, but shall be disposed of away from the premises.

END OF SECTION

SECTION 03 35 46

CONCRETE TOPICAL TREATMENTS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Work Included:
1. Application of cure and seal to new**,** patched, and existing concrete floor slabs.

B. Related Work:
1. Section 03 30 00 - Cast-In-Place Concrete

1.2 SUBMITTALS:

A. Product Data: Manufacturer's complete product information and application instructions.

B. Certificate: Manufacturer's written certification that proposed products comply with applicable Volatile Organic Compound (VOC) regulations.

1.3 QUALITY ASSURANCE:

A. Comply with Texas Natural Resources Conservation Commission *Regulation V* regarding VOC content of Architectural coatings. Architectural coatings are protective or decorative coatings applied to interior or exterior of buildings or structures, including latex paint, alkyd paints, stains, lacquers, varnishes, and urethanes.

B. Apply only when air temperature is between 40ºF and 90ºF. Allow materials to reach ambient temperature prior to application.

C. Do not apply sealer to concrete surfaces scheduled to receive adhered floor coverings such as resilient flooring and carpet.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in factory packaging with tags and labels intact and legible.

B. Store in a dry, ventilated area protected from freezing.

C. Carefully handle to prevent spills. Close container after each use.

PART 2 - MATERIALS

2.1 PRODUCT/MANUFACTURER:

A. Cure and Seal Basis of Design: Provide VOCOMP-25 cure and seal for concrete surfaces that produces a clear, high gloss, non-yellowing, slip-resistant penetrating finish as manufactured by W. R. Meadows.
1. Acceptable Manufacturers:
Super Diamond Clear VOX; Euclid Chemical
L&M Dress & Seal WB25; L&M Construction Chemicals/Laticrete International
Vocomp 25; W.R. Meadows
2. Substitutions for Equivalent Products: Refer to SECTION 01 62 00 - PRODUCT OPTIONS for substitution request procedures.
3. Water-based acrylic curing and sealing compound shall be a non-yellowing, clear, acrylic curing and sealing compound meeting the following requirements:
a. ASTM C 309, Type 1, Class B
b. AASHTO M 148, Type 1, Class B
c. ASTM C 1315, Class A, Section 6.4.1 – non-yellowing
d. ASTM C 1315, Section 6.6 – exceed 50 MPa (70 psi) adhesion requirements.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Prepare concrete surfaces to be sealed according to manufacturer's recommendations.
   1. Remove all existing curing compounds, oil, grease, laitance, and other incompatible materials.
   2. Apply cure and seal only to properly cleaned, etched, and thoroughly dried concrete surfaces.

B. Protect adjacent surfaces from overspray, including joint surfaces prior to installation of joint sealant.

3.2 APPLICATION:

A. At new concrete, apply after surface water glaze is gone.

B. Spray first coat uniformly at the rate of 300 sf/gal. Let first coat dry 6 to 8 hours before applying second coat. Apply second coat uniformly at the same rate in the opposite direction. Squeegee or wipe up all puddling.

C. Apply only to areas where sealed concrete floor finish is scheduled.

D. Apply two uniform coats at 300 sf per gallon each without puddling, according to manufacturer's written instructions.

3.3 CLEANING AND PROTECTION:

A. Clean up and legally dispose of all debris, containers, and other materials from flooring work. Remove from Owner's property.

B. Protect surfaces from traffic for at least 8 hours after final coat application.

END OF SECTION

SECTION 03 54 13

SELF-LEVELING UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Liquid applied gypsum floor underlayment.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry: Plywood subflooring.

1.2 SUBMITTALS

A. Submit manufacturer's mix and installation instructions under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in self-leveling underlayment with 3-years experience.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Perform work at ambient temperatures at or above 50° F.

B. During cure process, ventilate room spaces to remove moisture.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Gyp Crete® 2000 Floor Underlayment as made by Maxxon Southeast, Inc. (phone 800.247.5266 web site: www.maxxonse.com/gypcrete.html).

B. Substitutions: Under provisions of SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 MATERIALS

A. Underlayment: Gypsum based cementitious mix.

B. Water: Drinkable and not detrimental to underlayment.

C. Primer: To manufacturer's instructions.

D. Joint and Crack Filler: Latex based.

E. Sand: Meeting Gyp. Crete Specification no. 101, using 1.8 cu.ft. of sand per 80 lb. of Gyp Crete.

2.3 MIXING

A. Site mix 1.4 mix design materials in accordance with manufacturer's instructions.

B. Mix to achieve following characteristics
1. Density: 115 lb/sq ft minimum dry density.
2. Compressive Strength: 2000 psi minimum in accordance with ASTM C 472.
3. Fire Hazard Classification: 0/0/0 (Flame/Fuel/Smoke) rating in accordance with ASTM E 286.

C. Mix to consistency to achieve self-leveling.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify substrate surface is ready to receive work of this Section.

3.2 PREPARATION

A. Remove nubs, projections, irregularities. Fill voids, deck joints and irregularities with filler. Finish smooth.

B. Vacuum clean substrate surfaces.

C. Prime wood substrate. Allow to dry.

3.3 INSTALLATION

A. Install underlayment in accordance with manufacturer's instructions and recommendations for minimum and maximum thicknesses.

B. Install after partition installation.

3.4 CURING

A. Air cure in accordance with manufacturer's instructions.

END OF SECTION

SECTION 04 20 00

MASONRY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Unit masonry construction.

B. Related Requirements:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 03 11 00 - Concrete Forming and Accessories: dovetail anchor slots.
3. Section 04 72 00 - Cast Stone Masonry.
4. Section 05 50 00 - Metal Fabrications: steel lintels.
5. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System
6. Section 07 65 00 - Flexible Flashing: through-wall flashing for masonry walls.
7. Section 07 19 00 - Water Repellents.
8. Section 07 27 26 - Fluid-Applied Membrane Air Barriers.
9. Section 07 92 00 - Joint Sealants.
10. Section 07 95 00 - Expansion Control.
11. Section 08 11 00 - Hollow Metal Doors and Frames: installation of steel frames.
12. Section 10 99 00 - Miscellaneous Specialties; Recessed Knox Box.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Submit for each type of product indicated.
1. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

C. Samples: Within 60 days after the contract has been awarded, submit manufacturer's standard sample panel showing full range of color, approximately 12" x 24" for each color and size of brick required.

D. Test Reports: Manufacturer of the concrete masonry units shall submit:
1. Certified test reports showing that the units to be furnished meet the requirements of ASTM C 90 and C 129, and have the required minimum compressive strengths.
2. Reports certifying concrete masonry units meet or exceed each of the fire-resistive ratings.

E. Provide a diagram of proposed control joints and expansion joints.

F. Submit steel reinforcing shop drawings for load-bearing concrete masonry unit walls, including elevations showing reinforcing, control joints, bond beams, dimensions and details.

G. Mortar Mixture Proportions: ASTM C 270, Submit copies of each proposed mix design for review prior to starting masonry work.

H. Grout Mixture Proportions: ASTM C 476, Submit copies of each proposed mix design for review prior to grout placement.
1. Include recent historical grout cylinder strength test reports for each mix design.

I. Pre-blended Mortar and Grout Certificates: Submit manufacturer’s certificates that products meet or exceed specified requirements.
1. Mortar: Submit test reports, per ASTM C 780, for each mortar mix indicating strength of mortar mixes. Submit computer batch-ticket to confirm the mixes meet the project SPEC MIX specifications for every bag of mortar.
2. Grout: Submit test reports, per ASTM C1019, for each grout mix indicating compressive strengths. Submit computer batch-ticket to confirm the grout mixes meet the project SPEC MIX specifications for every bag of grout.

1.3 QUALITY ASSURANCE

A. Manufacturer: Manufacturer shall have a minimum of five years' experience manufacturing the specified product.

B. Installer: Masonry contractor shall have a minimum of five years' experience in similar types of work and be able to furnish a list of previous jobs and references if requested by the Architect.

C. Pre-installation Conference: Contractor shall schedule pre-installation conference at the project site with Architect/Engineer and Owner's Testing Lab. Conference shall be held prior to proceeding with masonry work and shall comply with requirements in Division 01 Section "Project Management and Coordination".

D. Expansion Joints (Control Joints): Provide expansion joints as shown on the Drawings or if not shown, install at frequency and in accordance with details as recommended by the N.C.M.A. or B.I.A. Confirm locations and frequency with Architect before beginning work. Refer to expansion joint Paragraph in the Installation portion of this specification section.

E. Mock-up: Construct a sample wall panel at the site using brick veneer, mortar, and masonry backup proposed for the project. The panel shall duplicate the typical building wall construction (coursing, bonding, joint treatment, sealant, cleaning methods and materials as required in SECTION 07 92 00 - JOINT SEALANTS). Sample panel shall be fully acceptable to the Architect prior to ordering of materials. Install one vertical 3/8" control joint for full height of panel. Panel shall be not less than 4 ft. by 3 ft. Construct panel on a wood pallet, providing portability around the project site. Do not alter nor destroy mock-up until attainment of Substantial Completion. Approved mock-up panel shall be the standard of comparison for workmanship and materials.

F. Fire-resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Brick Delivery: Do not lay face brick until at least 50% of the brick for the project has been delivered. As brick work progresses, make additional deliveries of brick so that at all times at least 50% of the remaining brick requirements are on the project site. Serve masons brick intermixed from the various storage piles to assure blending of brick.

B. Store face brick and masonry units above ground on wood pallets which allow air circulation under the stacked units.

1.5 PROJECT CONDITIONS

A. Refer to "Protection" Paragraph for daily activities.

B. Cold Weather Construction: Do no masonry work when freezing weather is expected. If Contractor elects to lay masonry when air temperature falls or is expected to fall below 40°F., provide construction means and protection of completed masonry as described in BIA Technical Note 1 - Cold and Hot Weather Construction -- Construction and Protection Recommendations.
   1. The use of admixtures or antifreezes to lower the freezing point of mortar shall not be permitted.

C. In hot weather (above 99°F. with less than 50% relative humidity) protect masonry construction from direct exposure to sun and wind.

D. Temporary Bracing: Take adequate precautions to prevent damage to walls during erection by high winds or other forces. Where necessary, provide temporary bracing until the designed lateral strength is reached.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

A. Brick Veneer: ASTM C 216 face brick or ASTM C 652 hollow brick.

1. Face Brick: ASTM C 216, Grade SW, Type FBS, face brick.
2. Hollow Brick: ASTM C 652, Grade SW, Class H40V, Type HBS, hollow brick with 3/4" minimum shell thickness on outer face shell, inner face shell, and end webs.
3. (BR-01, BR-02) Brick Veneer: Modular size face brick or hollow brick with actual dimensions of 3-5/8”D x 2-1/4"H x 7-5/8"L. Provide “Crimson Velour” as manufactured by Acme. Manufacturer's identification on brick will not be acceptable.
4. (BRT-01, BRT-02) “Thin” Brick Veneer: Modular size face brick or hollow brick with actual dimensions of 3/8”D x 2-1/4"H x 7-5/8"L. Provide “Crimson Velour” as manufactured by Acme. Manufacturer's identification on brick will not be acceptable.
5. Substitutions: Requests for substitutions will be considered in accordance with provisions of SECTION 01 62 00 - PRODUCT OPTIONS.

B. Special Brick Shapes: Provide special shapes and sizes of face brick and glazed brick as required for a complete project. Exposed surfaces to match the face brick in color, texture, and blend. Special shapes and sizes shall include, but not be limited to, the following:
1. Solid bricks at soldier bond corners
2. Two-faced brick at corners, windows, and doors.
3. Solid bricks at windowsills.

C. Common Brick: ASTM C 62, Grade MW, hard-burned stiff mud or dry-pressed brick. Use common brick where concealed brick is required.

D. Concrete Masonry Units: ASTM C 90, lightweight, for load-bearing units; ASTM C 129, lightweight, for non-load-bearing units. Provide hollow units made from Portland cement and lightweight mineral aggregate.
1. All units shall be from the same manufacturing plant and shall have the same surface texture.
2. Use load-bearing units for exterior wall backup and load-bearing partitions, non-load-bearing units elsewhere.
3. Provide 1" bullnose units at exposed outside corners and jambs and as noted on drawings.
   a. Provide square edge starter course corners at all rubber base conditions where preformed base corners are specified to be provided.
   b. Provide square edges at all furred units and units to be covered with ceramic tile.
4. Provide sash block control joints at concrete block walls with pre-molded rubber control joint filler.
5. Provide 5" starter blocks where required.
6. Nominal Size: 8" x 16" face.
7. Minimum compressive strength as shown on the structural drawings.
8. Provide “equivalent concrete masonry thickness” required for fire-rated assemblies where required.

E. Related Materials:
1. Bond Breaker: ASTM D 226, Type I (No. 15), non-perforated asphalt-saturated felt.

2.2 REINFORCING AND TIES

A. Wall Ties: ASTM A153
1. For Brick Veneer at CFS: Provide adjustable veneer anchors consisting of 14 gage, ASTM A580, stainless steel screw-on backplates and holes at top and bottom with legs in length as required to accommodate insulation thickness as shown on drawings and specified in Section 07 21 00 - Building Insulation. Also provide polymer-coated screws and stainless steel ties/pintles of 3/16" diameter, with pintle length as required. Product/manufacturer; one of the following:
   213 with 282; Heckman Building Products, Inc.
   HB-213 with 2X Hook; Hohmann & Barnard, Inc.
   2401 (RJ-711) with 242 Hook; Wire-Bond (Masonry Reinforcing Corp. of America)
2. For Brick Veneer at CMU: Provide adjustable veneer anchors consisting of 14 gage, ASTM A580, stainless steel screw-on backplates and holes at top and bottom with legs in length as required to accommodate insulation thickness as shown on drawings and specified in SECTION 07 21 00 - BUILDING INSULATION. Also provide minimum 3/8” diameter by 1-3/4” long brass expansion bolt provided by anchor manufacturer, consisting of Type 304 stainless steel internal bolt, Type 18-8 stainless steel washer, and brass 260 alloy expansion sleeve and expander cone. Steel ties/pintles shall be stainless steel of 3/16" diameter, with pintle length as required. Product/manufacturer; provide the following or approved equivalent:
   HB-5213 with 2X Hook; Hohmann & Barnard, Inc.

B. Column Anchors: ASTM A 666 and ASTM A 480 304 Stainless Steel, Type 304, 1-1/4” wide x 1/4” thick x length to suit condition, for tying masonry walls to steel columns.

C. Dovetail Slots and Anchors: ASTM A 666 and ASTM A 480, stainless steel, Type 304, with corrugated stainless steel ties 1" wide x length required to suit condition.

D. Wall Ties for CMU Veneer at CMU Backup: Provide adjustable veneer anchors consisting of 14 gage, ASTM A580, stainless steel screw-on backplates and holes at top and bottom with legs in length as required to accommodate insulation thickness as shown on drawings and specified in SECTION 07 21 00 - BUILDING INSULATION. Also provide minimum 3/8" diameter by 1-3/4" long brass expansion bolt provided by anchor manufacturer, consisting of Type 304 stainless steel internal bolt, Type 18-8 stainless steel washer, and brass 260 alloy expansion sleeve and expander cone. Steel ties/pintles shall be stainless steel of 3/16" diameter, with pintle length as required. Product/manufacturer; provide the following or approved equivalent:

HB-5213 with 2X Hook; Hohmann & Barnard, Inc.

E. Joint Reinforcement at Single-wythe Concrete Masonry Unit and Concrete Masonry Unit Veneer: Provide ladder type with continuous 9 gage ladder side and cross rods spaced not more than 16" o.c. and welded, unless smaller spacing is shown on the drawings. Product/manufacturer; one of the following:

#220 Ladder-Mesh; Hohmann & Barnard, Inc.
Series 200 Ladder Mesh; Wire-Bond

1. Finish shall be Class 1 mill galvanized.

F. Joint Reinforcement at Multi-wythe Concrete Masonry Unit: Provide ladder type with continuous 9 gage side and cross rods spaced not more than 16" o.c. and welded, unless smaller spacing is shown on the drawings. Product/manufacturer; one of the following:

#270-2X Ladder Eye-Wire; Hohmann & Barnard, Inc.
Series 800 Ladder; Wire-Bond

1. Finish shall be hot-dip galvanized.
2. Corners and tees shall be prefabricated.

G. Reinforcing Steel: ASTM A 615, Grade 60, deformed billet steel.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, domestic manufacture.
1. Provide white Portland cement for colored mortar and mortar used in laying glazed structural facing tile and glazed brick.
2. Provide natural Portland cement for other masonry.

B. Lime: ASTM C 207, Type S, with not more than 8% unhydrated oxides.

C. Aggregate for Mortar; Sand: ASTM C 144, well-graded natural sand. Provide white or light color sand for colored mortar and white mortar.

D. Aggregate for Grout: ASTM C 404.

E. Coloring Pigment: Custom blended mortar color(s) as selected by Architect. Provide coloring pigment as manufactured by Lambert Southwest, Inc., (phone 903.657.4680 web site: www.lambertsw.com) or Solomon Colors (phone 800.624.0261 web site www.solomoncolors.com).

F. Water: Clean and free of deleterious amounts of acids, alkalis, or organic materials.

G. Water-repellent Admixture: Provide same integral liquid polymeric water repellent admixture used in split-faced and burnished concrete masonry units for mortar used in laying split-faced and burnished concrete masonry units.

2.4 MORTAR; FIELD PREPARED

A. Mix proportions: ASTM C 270, mortar proportions by volume:
1. Type N Mortar - Exterior and Interior at masonry veneer construction:

1 part Portland cement
1 part lime
6 parts sand

Coloring Pigment: Add coloring pigment at manufacturer's recommended rate to obtain custom blended colors as selected by Architect. No mortar color is required at concealed or painted masonry.

2. Type M Mortar - Exterior masonry veneer construction below grade or in contact with earth:
   1 part Portland cement
   1/4 part lime
   3-3/4 parts sand
3. Type S Mortar - Exterior and Interior at load-bearing and non-load-bearing concrete masonry unit walls:
   1 part Portland cement
   1/2 part lime
   4-1/2 parts sand

   Coloring Pigment: Add coloring pigment at manufacturer's recommended rate to obtain custom blended colors as selected by Architect. No mortar color is required at concealed or painted masonry.
4. Bedding Mortar:
   1 part Portland cement
   1/7 part lime
   3 parts sand

B. Mixing:
1. All dry material shall be accurately measured in a leak-proof batching box. Contractor shall have the option of using a pre-manufactured cubic foot batching box or fabricating a wood box for measuring dry materials by volume. Box may be a convenient size, but shall be not less than 12" x 12" x 12" inside dimensions. The use of shovels for measuring dry materials is strictly prohibited.
2. Proportion mortar accurately and mix thoroughly with the maximum amount of water to produce a workable consistency for at least 5 minutes in a mechanical batch mixer. Keep tools and mixing equipment clean.
3. Do not use mortar which has begun to set, or if more than 2½ hours have elapsed since initial mixing. Do not re-temper mortar.
4. Mortar for Split-face, Smooth-face, and Burnished Concrete Masonry Units: Add water repellent admixture at manufacturer's recommended rates to ensure mortar will be permanently water repellent.

C. Use: Lay exterior and interior masonry veneer construction using Type N mortar. Lay exterior masonry veneer below grade or in contact with earth using Type M mortar. Lay exterior and interior load-bearing and non-load-bearing masonry using Type S mortar. Where required use bedding mortar to set and fill hollow metal frames.

D. Masonry cement is not acceptable for mortar.

E. Do not use calcium chloride in mortar.

F. Pre-mix, dry or wet, is not acceptable for mortar, except as listed below; i.e. no other pre-mix mortars are acceptable.

2.5 MORTAR; PRE-BLENDED MORTAR MIXES, COLORED MORTAR MIXES, AND INTEGRAL WATER REPELLENT MORTAR MIXES

A. Basis of Design: Provide pre-blended mortar mix, colored mortar mix, and integral water repellent mortar mix as manufactured by SPEC MIX, Inc. (phone 888.773.2649 web site: www.specmix.com) or Quikrete Cement and Concrete Products–Dallas (800.627.6125) instead of field-prepared mortars. SPEC MIX or Quikrete pre-blended mortar option shall include manufacturer's standard silo system for mixing and delivery of mortar mixes.
1. Equivalent products will be reviewed and considered per SECTION 01 62 00 - PRODUCT OPTIONS.
2. Pre-blended mortar mixes shall be mixed with potable water in strict compliance with manufacturer's written instructions and recommendations.
3. Masonry cement is not acceptable for pre-blended mortar.

B. SPEC MIX PCL Sand Pre-blended Mortar Mix:
1. Material: Pre-blended factory mix of Portland cement, hydrated lime and sand aggregate mixtures.
2. Mortar Type: Property mixture Type S for exterior and Interior at load-bearing and non-load-bearing masonry unit walls and Type N for exterior and Interior masonry veneer construction.

C. SPEC MIX PCL Sand Pre-blended Colored Mortar Mix:
1. Material: Pre-blended factory mix of Portland cement, hydrated lime, sand aggregate, and color pigments.

2. Mortar Type: Property mixture Type S for exterior and Interior at load-bearing and non-load-bearing masonry unit walls and Type N for exterior and Interior masonry veneer construction.

D. SPEC MIX PCL Sand Pre-blended IWR Colored Mortar Mix:
1. Material: Pre-blended factory mix of Portland cement, hydrated lime, sand aggregate, color pigments, and incorporating dry SPEC MIX Integral Water-repellent Mortar Admixture.
2. Mortar Type: Property mixture Type S for exterior and Interior at load-bearing and non-load-bearing masonry unit walls and Type N for exterior and Interior masonry veneer construction.

E. Mixing: Mix mortar using manufacturer's standard mechanical mixer to ensure homogeneity and workability. Observe mixing times of 4-5 minutes, consistent from batch to batch. Use clean, potable water; add the maximum amount consistent with optimum workability.
1. At the end of the day, thoroughly rinse the mixer to avoid contamination of future mortar batches.
2. Discard mortar 2.5 hours after initial mixing.

2.6 GROUT; FIELD PREPARED

A. Grout shall conform to ASTM C 476. Provide grout for bond beams, masonry lintels, and reinforced masonry.
1. Fine Grout Proportions:
1 part Portland cement
1/10 part lime
3 parts fine aggregate
2. Coarse Grout Proportions
1 part Portland cement
1/10 part lime
3 parts fine aggregate
2 parts coarse aggregate

B. When placing grout in masonry, exercise extreme care to prevent grout from staining face of masonry.

2.7 GROUT; PRE-BLENDED

A. Basis of Design: Provide pre-blended grout mix as manufactured by SPEC MIX, Inc. (phone 888.773.2649 web site: www.specmix.com) or Quikrete Cement and Concrete Products, Dallas (800.627.6125) instead of field-prepared grouts. SPEC MIX or Qukrete pre-blended grout option shall include manufacturer's standard silo system for mixing and delivery of grout mixes.Equivalent products by Quikrete Cement and Concrete Products–Dallas (800.627.6125) will be considered acceptable.
1. Equivalent products will be reviewed and considered per SECTION 01 62 00 - PRODUCT OPTIONS.
2. Pre-blended grout mixes shall be mixed with potable water in strict compliance with manufacturer's written instructions and recommendations.

B. SPEC MIX Core Fill Masonry Grout:
1. Material: Pre-blended factory mix of cementitious materials and dried aggregates meeting ASTM C 476 requirements for reinforced masonry construction.
2. SPEC MIX Core Fill - Fine Grout: Pre-blended mix containing cementitious materials and fine aggregate designed to fill masonry voids two inches or less.
3. SPEC MIX Core Fill - Course Grout: Pre-blended mix containing cementitious materials and coarse aggregate designed to fill masonry voids greater than two inches.

C. Mixing: Mix grout using manufacturer's standard mechanical mixer to ensure homogeneity and workability. Observe mixing time of 5 minutes, consistent from batch to batch. Use clean, potable water; add the maximum amount consistent with optimum workability.
1. Discard unused grout 1.5 hours after initial mixing.

2.8 BRICK CLEANERS AND SEALERS

A. Use "Sure-Klean Vana Trol" as manufactured by ProSoCo, Inc., or an approved equivalent inorganic commercial masonry surface cleaner. "Sure Klean 600" may be used at concrete masonry units which are not adjacent to colored mortar and concrete masonry units which are scheduled to be painted.

2.9 ACCESSORIES

A. Control Joints: Preformed rubber material; RS Series Rubber Control Joint as manufactured by Hohmann & Barnard, Inc. or comparable products by Heckman. Width slightly less than wall thickness to allow for sealant material.

B. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.

C. Cellular Plastic Weeps:
1. One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8" less than depth of outer wythe.
2. Color shall be selected by Architect from full range of color samples.
3. Product/manufacturer; one of the following:
Mortar Maze weep vent; Advanced Building Products Inc.
No. 85 Cell Vent; Heckmann Building Products Inc.
Quadro-Vent; Hohmann & Barnard, Inc.
Cell Vent; Wire-Bond

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the cavity. Provide strips, full-depth of cavity, 10 inches high, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings. Product/manufacturer; Mortar Net™ with Insect Barrier, Mortar Net USA, Ltd. (phone 800.664.6638 web site: www.mortarnet.com).
1. 0.4” thick Mortar Net between back of brick and steel lintels, cut down to required height.
2. Provide single thickness 2” material at 1-3/4” to 2-1/4” wide masonry cavities.

E. Rebar Positioners: Size and type required to accurately place reinforcing steel in bond beams, concrete masonry unit lintels, and vertically in walls.

PART 3 - EXECUTION

3.1 PREPARATION

A. Wetting of Face Brick:
1. Draw a 1" circle with wax crayon on the bed surface of dry brick. Using medicine dropper, place 20 drops of water inside circle and measure time required for absorption of water.
2. If water is absorbed in less than 1-1/2 minutes, brick must be wet before being laid.
3. Brick shall have no visible moisture when laid.

B. Cleaning: Beams, slabs, and lintels on which masonry walls and partitions are to be laid shall be brushed thoroughly to remove loose dirt and laitance.

3.2 INSTALLATION

A. Installation Tolerances:
1. Maximum Variation from Plumb:
a. Vertical lines and surfaces of columns and walls:
1) 1/4" in 10'-0".
2) 3/8" in any story or 20'-0" maximum.
3) 1/2" in 40'-0".
b. External Corners or Control Joints:
1) 1/4" in any one story or 20'-0" maximum.
2) 1/2" in 40'-0".
2. Maximum Variation from Unit to Adjacent Unit: 1/32" maximum. Maximum variation is mandatory on walls where only one surface is exposed. Where two surfaces are exposed to view, the more prominent face, per Architect, is to have maximum variation maintained, with the less prominent face allowed to exceed the maximum tolerance.
3. Maximum Variation from Level or Grades for Exposed Lintels, Sill, Parapets, or Horizontal Grooves:
a. 1/4" in any bay or 20'-0" maximum.
b. 1/2" in 40'-0".
4. Maximum Variation from Plan Location or Linear Building Line or Related Portions of Columns, Walls, and Partitions:
a. 1/2" in any bay or 20'-0" maximum.
b. 3/4" in 40'-0".

5. Maximum Variation in Cross-sectional Dimension of Columns and Thickness of Walls: ±1/4.
6. Maximum Variation in Mortar Joint Thickness:
   a. Bed Joint: ±1/8".
   b. Head Joint: ±1/8".

B. Dimensions are based on modular units except for special details. If units other than units are used, there shall be no change in story heights or other main dimensions of partition centerlines, and connecting work shall be adjusted to changes in unit sizes.

C. Laying Brick: Lay brick level, plumb, straight, and true to line within tolerances specified above. Spread the mortar bed full width and relatively smooth. Do not furrow. Butter the end of each brick with mortar and shove into place to completely fill the head joint. Do not feather the brick with excess mortar cut from the bed.
1. At concrete foundations and beams, install bond breaker between first course of brick veneer and concrete bearing. Gaskets at bottom of cavity walls shall not be used as bond breakers unless gasket occurs under the first course of brick.
2. Cut masonry units with motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units to provide patterns shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Remove cut misfits and replace with properly cut units.
3. Lay brick with special coursing and jointing as detailed. Lay rowlock and soldier courses with uniform joints approximately 3/8" wide. Use uncored brick for the exposed ends of such courses and wherever the holes would be exposed.
4. When laying walls, keep the air space free and clear of mortar droppings and debris.
5. Unless shown otherwise, provide vertical control joints every 40'.
6. Refer to Expansion Joint Paragraph for Expansion Joints (Control Joints).

D. Laying Concrete Masonry Units: Spread mortar beds smooth and full to cover bearing areas. Do not furrow. Butter head joints and shove units into place. Head joints shall be staggered except where stack bond is specifically indicated. Make back joints full against the backing materials as each course is laid.
1. Leave pipe spaces open on one full side until pipe work has been completed and inspected.
2. Lay concrete masonry walls and partitions level, plumb, straight, and true to line within tolerances specified above.
3. Fill the cells of exposed concrete masonry units with grout for a width of 8" at the jambs of openings in exterior and interior walls.
4. Exposed ends of units at external corners shall be solid.
5. Units shown to be laid in stack bond shall be laid with such accuracy that a plumb line centered on a vertical joint in an upper course will be entirely within the width of the corresponding vertical joint in every lower course.
6. Unless shown otherwise, provide vertical control joints every 40'.
7. At sound absorbing concrete masonry units, provide slip-set stabilizer at 16" o.c., vertically,
8. Maximum pour of grout in vertical cells shall be limited to 5'-0" unless cleanouts are provided at each cell.

E. Installation of Reinforced Unit Masonry:
1. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
   a. Construct formwork to conform to shape, line, and dimensions shown. make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   b. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
2. Set reinforcing in required position and secure against displacement before grouting is started. Cells requiring vertical reinforcement and grout shall be aligned to provide continuous unobstructed vertical opening. Place vertical reinforcing in cells with enough steel extending to provide proper lap splice. Horizontal steel shall be fully embedded in grout.
3. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
   a. do not exceed the following pour heights for fine grout.
      1) For minimum widths of the grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.
      2) For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 60 inches.
      3) For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 12 feet.

4) For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 24 feet.

b. Do not exceed the following pour heights for coarse grout.
1) For minimum widths of the grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.
2) For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 60 inches.
3) For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 12 feet.
4) For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.

4. Provide cleanout holes at least 3 inches in least dimension for grout pours over 60 inches in height. Cleanouts shall be sealed after inspections before grouting.
a. Provide cleanout holes at each vertical reinforcing bar.
5. Place grout in lifts not exceeding 5 feet.
6. Consolidate grout at the time of initial placement.
7. Grouting of a section of wall shall be completed within one day with no interruptions greater than one hour.

F. Reinforcing Masonry Joints: Reinforce the bed joints of concrete masonry unit walls and partitions with continuous joint reinforcement strips.
1. Furnish strips in long lengths. Width of strips shall be 2" less than nominal overall width of the wall or partition.
2. Lap strip ends 12" and bed side rods in mortar for complete cover and bond.
3. Install strips in bed joints spaced 16" o.c., unless a smaller spacing is shown in the drawings. Reinforcement shall extend into and bond the facing wythe in walls. Reinforcement shall not occur in the same joint course as the masonry veneer anchors.
4. Install strips in bed joints of concrete masonry unit veneer spaced 16” o.c. vertically.
5. At concrete masonry unit veneer, discontinue horizontal joint reinforcement across control joints and reinforcement shall not occur in the same joint course as the masonry veneer anchors.
6. At exterior masonry walls, discontinue horizontal joint reinforcement across control joints.
7. At interior masonry walls and intersection of interior/exterior masonry walls, continue horizontal joint reinforcement across control joints.

G. Bonding: Tie together masonry unit construction within walls and at intersections of walls by masonry bond and staggered vertical joints. Toothing will not be permitted except where specifically authorized by the Architect. Where walls must be built in advance of adjacent walls, form the stop-off by racking back.
1. Lay brick facing wythe in standard running bond with staggered head joints except where special coursing is indicated. Tie multiple wythe construction together with horizontal joint reinforcement and tab ties.
2. Where bond with joint reinforcement cannot be made, use wall ties spaced not more than 16" o.c. horizontally and vertically. Ties shall be laid in the joints, not shoved into wet mortar after setting the next course of masonry.
3. Tie brick veneer back to steel stud curtain walls and concrete unit masonry with metal ties spaced 16" o.c. horizontally and 16" o.c. vertically. Around the perimeter of openings, edges, and tops and bottoms of walls, additional ties/anchors shall be installed at a maximum of 3 ft. o.c. within 12" of the opening. Secure ties through the sheathing to the studs with two screws and insert ties.
a. Secure wall tie backplates with fasteners that are wet-set with sealant compatible with the air- and water-resistive barrier system. After installation, apply sealant along top edge of backplate to shed water.
4. Tie masonry to structural steel columns by welding anchors to columns at 16" o.c. and inserting triangular ties. Ties shall be of the size required to extend a minimum of 1-1/2” into brick veneer, with a minimum mortar cover of 5/8” to the outside face of the veneer.
5. Where concrete is faced more than 12" high with masonry, bond masonry to concrete with anchors set into dovetail anchor slots cast into the concrete. Provide the anchors. Spacing shall be as specified above for wall ties.
6. Bond interior masonry walls and the intersection of interior/exterior masonry walls by forming control joints and reinforce with horizontal reinforcing at 16" o.c.
7. Partitions between rooms without suspended ceilings, and 4" thick partitions with an unsupported length of more than 12 ft. shall be extended to the floor or roof above and wedged and sealed against it. Extend other partitions above the highest adjacent ceiling, unless indicated to extend up to floor or roof above.

H. Joints shall be 3/8" wide. Joints shall be straight and uniform.

1. Tool and work exposed joints to a hard, dense surface with a sled runner and leave without shrinkage cracks. Delay tooling until the mortar has set thumbprint hard. Tool the joints in masonry walls behind chalkboards and tackboards.
2. Rake out the joints to be caulked and keep them free of mortar as the work progresses.
3. Provide control joints at inside corners with backer rod and sealant.
4. Mortar color changes: Location of mortar color changes in relation to masonry color changes shall be as directed by Architect. Contractor shall rake and point mortar joints or otherwise alter standard masonry procedures to satisfy this requirement.

I. Masonry Bearings: Provide bearings of common brick under framing members which bear on masonry walls unless the members bear directly on concrete-filled bond beams.

J. Chases: Form chases and recesses to the required dimensions and lines, strike joints flush and remove excess mortar. Before closing chases and similar inaccessible spaces with masonry, remove rubbish and sweep out the area.

K. Lintels and Beams: Provide lintels and beams for openings in masonry walls. This includes lintels at masonry openings for ducts. Verify duct layouts on the mechanical drawings.
   1. Reinforced Masonry Lintels: Construct and reinforce masonry lintels where shown.
      a. Make concrete masonry lintel units of the same material and by the same process as the other concrete masonry units used in the building.
      b. Use trough-type units, not regular units with the web knocked out. Fill the troughs with grout.
      c. Build lintels in place where possible and cure at least 14 days before subjecting them to load. Provide at least 8" bearing at each jamb.
      d. Where reinforcing is not specifically called out for masonry lintels, use not less than a #4 bar top and bottom of 8" high masonry units for each 4" thickness of wall.
   2. Bond Beams: Provide bond beams in masonry walls. Bond beams shall be continuous where possible. Provide rebar positioners to accurately position reinforcing steel.
   3. Steel Lintels: Build steel lintels into the masonry walls. Where reinforcing or steel shapes are not specifically called out for lintels in brick walls, use one steel angle for each 4" thickness of brick in the wall.

L. Flashing:
   1. Build in flashings which enter the masonry, using the materials and following the instructions of the pertinent sections of the specifications.
   2. Create end dams at ends of window heads, at edges of storefronts, and other vertical elements to channel water to nearest weep hole away from window mullions and other items which might allow water to travel vertically.

M. Weeps: Install weep holes in veneer at 24" o.c. [20" o.c. (king-size brick)] horizontally for clay masonry and 32" o.c. for 16" long concrete masonry, above through-wall flashing, above shelf angles, and at top and bottom of walls. Install plastic weeps in strict accordance with manufacturer’s written instructions and recommendations.

N. Cavity Drainage Material: Install cavity drainage material in cavities to comply with manufacturer’s written instructions and recommendations. Provide single thickness 2” material at 1-3/4” to 2” wide masonry cavities. Provide one or more thicknesses as required to fill cavity width at other conditions. Install cavity drainage material with fabric facing to the exterior of the wall.

O. Expansion Joints (Control Joints):
   1. At exterior masonry walls, discontinue horizontal joint reinforcement across control joints.
   2. At interior masonry walls and intersection of interior/exterior masonry walls, continue horizontal joint reinforcement across control joints.
   3. At concrete masonry unit veneer, discontinue horizontal joint reinforcement across control joint.
   4. Provide resilient continuous lengths of control joint material in concrete masonry unit sash blocks. Solvent weld butt and corner joints, in accordance with manufacturer's instructions.
   5. Size control joints in accordance with SECTION 07 92 00 - JOINT SEALANTS, for sealant performance, but in no case larger than adjacent mortar joints in exposed face brick.
   6. Reference SECTION 07 95 00 - EXPANSION CONTROL for Preformed, Foam Joint Seals PJS-1.
   7. Interior control joints are not required to align with exterior control joints.
   8. Provide vertical expansion joints in masonry (concrete masonry unit and brick), as follows:
      a. Where shown on drawings.
      b. Horizontal expanse:
         1) Brick:

a) 25'-0" max. spacing at walls without openings. Spacing includes the sum of the distance around outside corners.
b) 20'-0" max. spacing at walls with openings. Spacing includes the sum of the distance around outside corners.
c) Within 2'-0" of outside corners.

2) Concrete Masonry Units:
a) Not to exceed a length to height ratio of 1-1/2 : 1 or 25 ft., whichever is less.
b) Adjacent to corners of walls or intersections within a distance equal to half the control joint spacing.
c) At intersections with other CMU walls (joint reinforcing shall be continuous).

c. Within 2'-0" of outside corners.
d. At all inside corners.
e. Change of substrate including but not limited to the following:
1) Concrete masonry unit to metal stud back-up.
2) In masonry wall at intersection of concrete beam supported masonry and structural steel supported masonry.
f. As recommended by referenced standards.

9. Control joints shall extend continuous through bond beam although concrete and reinforcement for bond beam shall extend continuous through control joint.

P. Built-in Work:
1. As work progresses, build-in metal door frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other sections.
2. Build-in items plumb and level.
3. Bed anchors of metal door and glazed frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with mortar minimum 8" from framed openings.
4. Do not build-in organic materials subject to deterioration.

Q. Cutting and Fitting:
1. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other sections of work to provide correct size, shape, and location.
2. Obtain approval prior to cutting or fitting an area not indicated or where appearance or strength of masonry work may be impaired.

R. Miscellaneous Work:
1. Cooperate with other trades in installing their work in masonry. Furnish bedding mortar and set loose lintels. Cooperate in setting bucks and frames, maintain them in position and build them in with anchors properly placed. Do not distort frames by crowding.
2. Cut and form openings for recessed items and for electrical and plumbing installations so that wall plates and escutcheons will completely cover the openings. Cut edges shall be clean, sharp and straight.
3. Fill solid with mortar the spaces around and behind metal door frames.
4. Point with mortar the openings around flush-mounted electrical outlet boxes.

S. Sound-conditioned Masonry Walls: Fill cells of concrete masonry walls scheduled to be sound conditioned with grout.
1. Grouted masonry walls shall be covered with plastic sheeting secured with Hohmann & Barnard, Inc. Masonry Wall Clamp No. HB3000. Grout must be completely dry when wall is finished and enclosed.
2. At the end of each day's work, cover the tops of grouted masonry walls and other unfinished exposed cavity wall openings with secured plastic sheeting.

T. Curing: In dry weather, masonry exposed to wind and sun shall be wet with a fine water spray several times each day for at least 6 days, starting as soon as the mortar has set sufficiently to resist erosion.

U. Building Expansion Joints: Discontinue horizontal joint reinforcement across building expansion joints.

V. Non-load-bearing Concrete Masonry Unit Partitions: Partitions which extend up to structure above for fire, acoustical, or security reasons, shall terminate within 2" of structural deck, joists or beams to allow for deflection. Fill 2" gap with sealant and fire safing to achieve proper rating.

3.3 PROTECTION

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Maintain protective boards at exposed external corners which may be damaged by construction activities.

C. Provide protection without damaging completed work.

D. At the end of each day's work, cover the tops of masonry walls, window sills and jambs, door jambs, and other unfinished exposed cavity wall opening with plastic sheeting or other suitable material. Cover shall extend a minimum of 2' down both sides of walls and shall be held securely in place with Hohmann & Barnard, Inc. Masonry Wall Clamp No. HB3000.

E. Keep expansion joint voids clear of mortar.

3.4 POINT AND CLEAN

A. Pointing: Upon completion of the masonry work, fill and neatly point line nail holes and other defects. Remove mortar droppings from projecting surfaces.

B. Cleaning:
1. Clean face brick with a commercial cleaner. Test the cleaner on an inconspicuous area of face brick to insure that it performs as intended without leaving scum or residue. Before the solution is applied, soak the brick surface with clean water. Apply the cleaner in accordance with the manufacturer's instructions and rinse the surface thoroughly with clean water to remove traces of the cleaner. Protect metal and concrete surfaces from contact with the cleaner.
2. Clean glazed facing tile with brushes and clean water. Use no acids or abrasives.
3. Clean exposed concrete masonry units by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

3.5 FIELD QUALITY CONTROL

A. General: Owner will employ services of an independent materials testing laboratory to perform specified inspections and testing.

B. Coordinate with Owner’s testing laboratory to provide PERIODIC inspection of the following tasks:
1. As masonry construction begins, and every 5000 sq. ft. during construction, the following shall be verified to ensure compliance:
   a. Proportions of site prepared mortar.
   b. Construction of mortar joints.
   c. Location of reinforcement and connectors.
2. During construction, the inspection program shall verify:
   a. Size and location of structural elements.
   b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.
   c. Specified size, grade, and type of reinforcement and anchor bolts.
   d. Protection of masonry during cold weather (temperature below 40°F.) or hot weather (temperature above 90°F.).
3. Prior to grouting at interior non-load-bearing partitions shown in the Architectural drawings, the following shall be periodically verified to ensure compliance:
   a. Grout space is clean.
   b. Placement of reinforcement and connectors.
   c. Proportions of site-prepared grout.
   d. Construction of mortar joints.

C. Coordinate with Owner’s testing laboratory to provide CONTINUOUS inspection of the following tasks:
1. Prior to grouting at masonry walls shown on the Structural Drawings, the following shall be continuously verified to ensure compliance:
   a. Grout space is clean.
   b. Placement of reinforcement and connectors.
   c. Proportions of site-prepared grout.
   d. Construction of mortar joints.

e. Grout placement shall be verified to ensure compliance with code and construction document provisions.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 04 72 00

CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Labor, materials and equipment to provide the cast stone as indicated on the drawings and specified herein.
2. The manufacturer shall furnish and deliver all cast stone covered by this specification.
3. Contractor shall unload, store and set all cast stone covered by this specification and shall provide and install all anchors for same.

B. Related Sections:
1. Section 04 20 00 - Masonry Units.
2. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:
1. Initial Selection:
a. Submit samples for color selection by Architect.
b. Submit samples for colored mortar, showing the full range of colors available.
2. Following color selection by Architect, re-submit 3 samples approximately 8" x 8", finished to show the variation in color and texture which will occur in the material delivered to the project site.

C. Product data:
1. Provide construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.
2. Test results of cast stone previously made by the manufacturer.
3. Qualification Data: Provide lists of completed projects with project names and addresses, names and address of architects and owners, and other information necessary.

D. Shop Drawings:
1. Drawings shall show the sizes, profiles, cross-sections, and dimensions of stone, the arrangement of joints, bonding, connections to adjoining walls or materials, anchoring methods, anchors, reinforcing, method of installation and anchoring.
2. Provide suitable slope on all exterior sills, copings, projecting courses and pieces with exposed top surfaces.
3. Window sills, when provided, shall have raised fillets at the back.
4. All projecting pieces and soffit stones shall have drips under the outer edge.
5. The shop drawings shall show the setting mark of each stone and its location on the structure. The stone when delivered shall bear the same corresponding setting mark on an unexposed surface.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Firm with not less than five years of continuous operation, having successful experience, adequate facilities, and capacity to furnish the quality, sizes, and quantity of cast stone required without delaying the progress of work.
2. Manufacturer shall be responsible for reinforcement and anchorage design.
3. Firm shall be a current producer member of the Cast Stone Institute.

B. The average water absorption of cast stone shall not exceed 6% by dry weight when tested in accordance with the requirements of ASTM C 642 or ASTM C 1195.

1.4 DELIVERY, STORAGE, AND HANDLING

A. All cast stone shall be carefully loaded and packed for transportation exercising customary and reasonable precaution against damage while in transit.

B. All cast stone shall be received and unloaded at the project site by competent workmen with the necessary care and handling to avoid damage and soiling.

C. Cast stone units delivered to the site shall be inspected for damage, unloaded, and stored with a minimum of handling. Damaged stone will be rejected and shall be removed from the project site.

D. Protect cast stone during storage and construction against wetting, soiling, staining, and damage.

E. The cast stone material shall be stored clear of the ground on non-staining planking or pallets in such a manner as to be protected from damage while in storage. Should cast stone be stored for an extended period, cover with polyethylene or other non-staining waterproof material.

1.5 PROJECT CONDITIONS

A. Environmental Requirements: No stone shall be set when freezing weather is expected.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide cast stone units as manufactured by one of the following:
Advanced Architectural Stone; Fort Worth, Texas
CSCS/Stone Legends; Dallas, Texas
Dallas Cast Stone, Inc.; Dallas, Texas
Echelon Masonry, Atlanta, Georgia
Siteworks Architectural Cast Stone, Houston, Texas

2.2 CAST STONE MATERIALS

A. Raw Materials:
1. Portland Cement: ASTM C 150, Type I or Type III, white, domestic manufacture.
2. Fine Aggregate: Carefully graded and washed natural sands, or manufactured granite, quartz or limestone sands meeting ASTM C 33 except that gradation may vary to achieve desired finish and texture.
3. Coarse Aggregate: Carefully graded and washed natural gravels, or crushed, graded stone such as granite, quartz, limestone or other durable stone meeting ASTM C 33 except that gradation may vary to achieve desired finish and texture.
4. Color and Finish:
   a. Color shall be as selected by Architect.
   b. Coloring Agent: Inorganic (natural or synthetic) iron oxide pigments complying with ASTM C 979, excluding the use of a cement grade of carbon black pigment, and shall be guaranteed by the pigment manufacturer to be non-fading and limeproof. The amount of pigment shall not exceed 10% by weight of the cement used.
   c. The samples shall be approved by the Architect before the manufacturer shall be permitted to proceed with the work.
   d. Match sample on file in Architect's office. Color and texture of cast stone shall be generally equal to the approved sample when viewed in direct daylight at a 10-foot distance.
   e. Exposed surfaces, unless shown otherwise, shall exhibit a fine grained texture similar to natural stone. No bug holes or air voids will be permitted.
   f. Variation: Must match color and finish of approved sample subjected to similar aging and weathering conditions when viewed in direct daylight at a 10-foot distance.
5. Admixtures - ASTM C 494.
6. Water: Clean, potable and free of deleterious amounts of acids, alkalies, or organic materials.

B. Physical Properties:
1. Cast stone shall have a minimum compressive strength of 6,500 psi at 28 days when tested in accordance with ASTM C 1194.

2. Multiply requirements of field cut or core drilled specimens by 80% to determine minimum compressive strength requirements.

C. Curing and Finishing:
1. Cure units in a warm, moist curing chamber at 95% relative humidity for 24 hours, or yard cure for 350 degree-days (i.e. 7 days @ 50°F. or 5 days @ 70°F.) prior to shipment.
2. Acid-etch exposed surfaces to remove cement film prior to packaging for shipment.

2.3 REINFORCING AND ANCHORS

A. Reinforcing Bars: ASTM A 615, Grade 60. Bars shall be hot-dipped zinc coated after fabrication in accordance with ASTM A 123.

B. Reinforcing Mesh: ASTM A 185, No. 3 gage zinc-coated wire rods electrically welded on 4" centers each way.

C. Anchors, inserts, and dowels shall be corrosive resistant, galvanized, brass or stainless steel Type 304.

D. Cast stone panels shall be reinforced as may be required for handling, and to allow for temperature changes and structural stress.

E. There shall be a minimum steel reinforcement amounting to ¼ percent of the cross-section area of the panel and should the panel be greater than 12" in any sectional dimension, the temperature steel shall be placed in both directions.

F. Reinforcement shall be galvanized or epoxy coating when covered with less than 1-1/2" of material.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, white, domestic manufacture.

B. Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144, clean, washed, masonry natural sand.

D. Color: ASTM C979, Non-fading, iron oxide, limeproof pigment to produce mortar color as selected by Architect to match cast stone. The Architect shall approve the actual color sample of mortar before proceeding with grouting or pointing.

E. Water: Clean and free of deleterious amounts of acids, alkalies, or organic materials.

2.5 MORTAR MIXES

A. Setting Mortar: Proportions by volume:
1 part Portland cement
1 part lime
6 parts white silica sand

B. Pointing Mortar: Proportions by volume:
1 part Portland cement
1 part lime
6 parts white silica sand

C. Coloring agent as required to provide consistent custom color.

2.6 FABRICATION

A. General: Cast stone shall be Type I complying with ASTM C 1364, color as selected by Architect. Cast units shall be free from defects such as cracks, loose aggregate, broken edges, and marred finish surfaces which may affect appearance or serviceability. All units shall be equal in color and surface texture to approved samples.

B. The manufacturer shall be responsible to design a mix which achieves both the strength and the surface finish desired.

C. The average water absorption of cast stone shall not exceed 6% by dry weight when tested in accordance with the requirements of this specification.

D. All casting shall be done in accurate molds designed to withstand high frequency vibration. Steel reinforcement units shall be accurately placed. Vibration shall be continuous during the casting process until full specified thickness is reached and all excess water brought to the surface.

E. Curing: No cast stone shall be shipped to the project site until after it has been properly cured at the manufacturer's plant as specified.

F. Fabrication Tolerances: Comply with Cast Stone Institute Technical Manual (current edition).
1. Height and Width: Plus 1/16", minus 1/8"
2. Length:
   a. Up to 2'-0": Plus 1/16", minus 1/8"
   b. 2'-0" to 5'-0": Plus 1/8", minus 1/8"
   c. 5'-0" to 10'-0": Plus 1/8", minus 3/16"
3. Setting tolerances: Plus or minus 1/8" allowable out of plane from adjacent unit.
4. Joints: +1/16", -1/8".

PART 3 - EXECUTION

3.1 JOINTING

A. Joint Size:
1. At stone/brick joints - 3/8".
2. At stone/stone joints in vertical position - 1/4"
3. Stone/stone joints exposed on top side - 3/8".

B. Joint Material:
1. Use a full bed of mortar at all bed joints.
2. Sealant: Head joints in copings, and joints at column covers, cornices, platforms, soffits, window sills, and in general, all stone sections with projecting profiles, exposed top joints or rigid suspension connections to the supporting structure should be set with unfilled joints. After setting, prime the ends of stones, insert properly sized foam back-up rod to proper depth, and gun-in sealant.
3. Mortar: Masonry-bound trim such as belt courses, lintels, window surrounds, date stones, inscription blocks, quoins, keystones, similar applications, and vertical joints shall be mortar joints.
4. Rake all mortar joints 3/4" for either pointing mortar or sealant as selected by Architect.

C. Location of joints:
1. As shown on approved shop drawings.
2. Unless otherwise shown, at control and expansion joints per plan.

3.2 ERECTION

A. Stone shall be clean. Before setting, sponge or drench with clean water.

B. Set stone units level, square, and true with uniform mortar joints as specified.

C. All cast stone shall be set by experienced masons, accurately and in accordance with the shop and setting drawings.

D. Unless otherwise noted, every stone shall be set in a full bed of mortar.

E. Reference “Joint Materials” paragraph in the “Jointing” Article above for direction on erection/installation at the different joint areas.

F. All anchors and dowels shall be firmly placed and all anchor holes and dowel holes and similar holes filled completely with mortar or non-shrink grout.

G. All anchors, dowels and other anchoring devices shall be furnished by the setting contractor as shown on approved shop drawings using, whenever possible, standard building stone anchors commercially available in a non-corrosive material such as galvanized steel, brass or Type 304 stainless steel.

H. When setting with mortar, all stones not thoroughly wet shall be drenched with clear water just prior to setting.

I. After each stone has been set, all joints shall be raked to a depth of 3/4" from the face for pointing. The face of each stone shall then be sponged off to remove any splashed mortar or mortar smears.

J. Only the ends of lugged sills and similar stones shall be embedded in mortar. The balance of joint to be left open until pointing of stone work, than tuck points on face only to a depth of 3/4". Tuck point stone joints to a slight concave.

K. All stone shall be protected from splashing mortar or damage by other trades.

L. Form weep holes at the bottom of every vertical joint. Form weep holes with 1/4" oiled sash cord or plastic tubing and remove when the mortar has set.

M. Installation tolerances shall be in accordance with requirements of SECTION 04 20 00 - MASONRY UNITS.

3.3 TESTING

A. Testing shall be performed in accordance with ASTM C 31, ASTM C 39, ASTM C 642, and ASTM C 1194, except that 2" cube specimens shall be used, oven-dried in accordance with ASTM C 97.

B. Test three specimens per 500 cubic feet at random from plant production in accordance with referenced standards.

C. The results of compression tests shall be divided by a factor of 0.8 when saw-cut or core-drilled specimens are used.

3.4 PATCHING AND CLEANING

A. The repair of chipped or damaged cast stone shall be done only by mechanics skilled in this class of work, with materials furnished by the manufacturer and according to this direction.

B. Before pointing, the face of all cast stone shall be scrubbed with a fibre brush, using soap powder and water and shall then be thoroughly rinsed with clean running water. Any mortar on the face of the cast stone shall be removed. No acids or prepared cleaners shall be used without the approval of the cast stone manufacturer.

3.5 POINTING AND CAULKING

A. When ready for pointing, the joints shall be dampened and carefully pointed to a slight concave unless otherwise specified by the Architect. No pointing shall be done in freezing weather nor in locations exposed to hot sun, unless properly protected. The Architect shall approve color of pointing mortar before proceeding with pointing.

B. Head joints in copings and similar stones shall be caulked with a joint sealant used in accordance with the manufacturer's instructions.

3.6 INSPECTION AND ACCEPTANCE

A. Applicable standards for inspection and quality control shall be ACI Committee 311 Manual of Concrete Inspection and PCI MNL-117 Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

B. Cast stone shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye at a 20 ft. distance in good typical daylight illumination.

3.7 PROTECTION

A. Cast stone shall be protected after erection and until final cleaning by non-staining rosin sized paper or polyethylene film of not less than 4-mil thickness.

B. Cast stone at entrances shall be protected until substantial completion is achieved.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Structural metal framing.

B. Related Sections:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 03 30 00 - Cast-in-place Concrete: grouting under base plates.
3. Section 05 21 00 - Steel Joists Framing.
4. Section 05 31 00 - Steel Decking.
5. Section 05 40 00 - Cold-formed Metal Framing: lightgage framing.
6. **Section 07 81 16 - Cementitious Fireproofing.**

1.2 SUBMITTALS

A. General:
1. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Contractor shall be responsible for omissions and errors and for conformance with the drawings and specifications relative to the various details.
3. Architect's review will cover member sizes, strength of connections and general arrangements but not dimensions or quantities.

B. Shop Drawings: Indicate shop and erection details, including cuts, copes, connections, holes, threaded fasteners and welds.

C. Product Data:
1. Provide Manufacturer's data and certification for pre-assembled bolt, washer, and nut.
2. Provide copy of Welders' Certification. Welders must show proof of certification within the last year prior to starting any welding on the project.

1.3 QUALITY ASSURANCE

A. Codes and Standards:
1. Fabrication and erection shall comply with the requirements of AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation and "Code of Standard Practices for Steel Buildings and Bridges", latest editions.
2. Welders and welding procedures shall comply with requirements of ANSI/AWS D1.3 Structural Welding Code.
3. Steel Structure Painting Council
   a. Painting Manual, Volume 1, Good Painting Practice.
   b. Painting Manual, Volume 2, Systems Specifications.
4. Research Council on Riveted and Bolted Structural Joints: "Specifications for Structural Joints using ASTM A 325 Bolts.

B. Design
1. Substitutions: Submit substitutions of sections or modifications of details, or both, and the reasons with the shop drawings for approval. Submitted substitutions must be clearly identified and noted as such. Coordinate approved substitutions, modifications, and necessary changes in related portions of the work by the fabricator and accomplish same at no additional cost to the Owner.
2. Responsibility for errors: The Fabricator shall be responsible for all errors of detailing, fabrications, and for the correct fitting of structural steel members.

1.4 QUALIFICATIONS

A. Structural Steel Fabricator: Not less than 10 years' experience in the fabrication of structural steel for buildings.

B. Structural Steel Erection: Not less than 5 years' experience in the erection of structural steel. Welders must be qualified to perform all procedures and positions encountered per AWS certification standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Bolts and other anchorage devices to be embedded in concrete and masonry shall be delivered to the site before the start of concrete or masonry work. Furnish setting drawings and templates for the installation of anchor bolts.

B. Fasteners shall be protected from dirt and moisture at the project site. Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protected storage. Fasteners not used shall be returned to protected storage at the end of the shift. Fasteners shall not be cleaned of lubricant that is present in as- delivered condition.

1.6 PROJECT CONDITIONS

A. Coordinate erection of structural steel with work of other trades.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel:
1. ASTM A 36, typical Channels, Angles, Bars, and Plates.
2. ASTM A 992, W Shapes.

B. Hollow Structural Sections: ASTM A 500, Grade B and C.

C. Pipe Columns: ASTM A 53, Grade B.

D. Anchor Rods, Bolts, Nuts, and Washers:
1. Anchor Rods: ASTM F 1554, Grade 55.
2. Nuts: ASTM A 563, heavy hex Grade C, C3, D, DH, or DH3.
3. Washers: ASTM F 436.

E. High-Strength Bolts, Nuts, and Washers:
1. Heavy hex steel structural bolts: ASTM A 325, Type 1, uncoated.
2. Heavy hex carbon-steel nuts: ASTM A 563, Grade C, C3, D, DH, or DH3.
3. Hardened carbon-steel washers: ASTM F 436.

F. Tension Control Bolt Assemblies: ASTM F 1852; Lohr "High Strength Rapid Tension Bolts".

G. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

H. Shop Paint: SSPC-Paint 25, Type I, iron oxide, zinc oxide, raw linseed oil, and alkyd. Do not prime areas which are to receive sprayed-on fireproofing.

I. Bituminous Paint: Cold applied asphalt mastic, SSPC Paint 12, compounded for 30-mil thickness per coat.

J. Bearing Pads: Neoprene rubber of 70 durometer hardness, as manufactured by Oil States Bearing Pad Division of Fluorocarbon.

2.2 FABRICATION

A. General: Fabricate structural steel in accordance with referenced specifications.
1. Drawings indicate the design, sections and weights of members. Make no substitutions except with the written permission of the Architect. Do not use dimensions scaled from the drawings for fabrication. Contractor shall, when necessary, determine actual dimensions at the building.
2. Workmanship shall conform to the best practice in structural steel shops. Materials shall be clean and straight. Shop kinks will not be permitted.
3. Exposed steel, where in view, shall meet the requirements of the AISC Manual for "Architecturally Exposed Structural Steel."

B. Connections shall conform to the standard specifications of the American Institute of Steel Construction.

C. Punching:
1. Shop-punch steel members for bolts and hanger rods needed to support wood nailers and other items.
2. At hollow structural sections located in the exterior building envelope, provide shop-punched holes in steel sections as indicated on drawings, for installation of sprayed foam insulation to completely fill hollow structural section cavity

D. Marking: Components of high strength steel required to have a yield stress greater than 36 kips/sq. in. shall be clearly marked with the ASTM designation over any shop coat prior to shipment from the fabricator's plant.

E. Shop Painting:
1. Do not paint steel surfaces to be welded, including top flange of steel beams that are to receive shear studs. Do not paint steel surfaces which are scheduled to receive sprayed-on fireproofing. Clean this steelwork of oil and grease with solvent cleaner and remove dirt and other foreign matter by sweeping with brushes or with compressed air.
2. Apply one coat of shop paint to steel. Prior to application of shop paint clean steel to remove loose mill scale, rust, weld slag, dirt, and other foreign matter. Clean welds of spatter, smoke, and iron oxide film. Remove oil and grease with solvent cleaner
3. Apply shop paint to dry surfaces thoroughly and evenly by brush, spray, roller coating, or dipping at the election of the fabricator.

PART 3 - EXECUTION

3.1 ERECTION

A. General: Comply with AISC Specifications and Code of Standard Practice, and as herein specified.

B. Erection of structural metal shall comply with the requirements of referenced codes and standards.
1. The use of a cutting torch for field correction of fabricating errors will be permitted only with the approval of the Architect. For each fabrication error the contractor shall submit a drawing of existing conditions and the proposed correction for the Architect's review.
2. Set column base plates to correct elevations; support temporarily on shims until the columns have been plumbed and grouted.
3. Make field connections by electric arc welding or with high-strength pre-assembled threaded fasteners.

C. Metal Protection: Apply two coats of bituminous paint to all steel members embedded or in contact with soil.

D. Make high-strength bolted connections in conformance with "Specifications for Structural Joints Using ASTM A 325 Bolts" as approved by the Research Council on Riveted and Bolted Structural Joints, November 13, 1985.
1. Prior to installation, clean bolts, nuts, and washers, if required. Dirt and noticeable rust on bolts, nuts, and washers will not be allowed.
2. Install Lohr "High Strength Rapid Tension Bolts" in accordance with the manufacturer's instructions.

E. Stud weld shear connectors through the steel deck to the steel beams using welding equipment and procedures recommended by the manufacturer of the stud anchors used.

F. Erect steel framing true and plumb; brace temporarily where necessary to handle all loads to which the structure may be subjected. The Contractor shall remove such bracing as part of his equipment. Securely connect all work to take care of dead load, wind, and erection stresses.

G. Steel framing members supporting and connected to metal panels shall be erected to ⅛" tolerance for entire member length in any direction.

H. Provide neoprene rubber bearing pads where steel beams bear on concrete.

3.2 FIELD QUALITY CONTROL

A. Inspection and Testing: Verification inspection and testing of all field connections shall be done by an Independent Testing Laboratory, and copies of the inspection and test reports shall be submitted to the Architect and Contractor. The cost of these inspections and tests shall be paid as specified in SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

B. High-Strength Bolted Connections: All bolted connections shall be visually inspected in accordance with manufacturer's specifications.

C. Welded Connections:
1. All field fillet welds shall be visually inspected in accordance with the applicable parts of AWS D1.1 Section 6, Inspection.
2. In addition to visual inspection, full penetration butt welds shall be subjected to ultrasonic testing in accordance with AWS D1.1, Section 6, Part C, Ultrasonic Testing of Groove Welds. Testing shall be performed on the percentage of welds set forth in the following schedule:

Level	Percent to be tested
1st and 2nd	100%

3. All welds that fail ultrasonic test shall be re-welded and re-tested until they pass the test.

D. Shear connectors:
1. Visual inspection and bend tests shall be performed in accordance with the applicable parts of AWS D1.1, Section 4, Technique.
2. In addition to the bend tests, 25 beams per floor shall be selected at random and on each beam five studs shall be hammered toward the center of the beam as per the manufacturer's recommendations. If any of the five studs show failure, all studs on the beam shall be hammered, and all that fail shall be replaced. For each beam with any defective studs, two additional beams shall be tested.

END OF SECTION

SECTION 05 21 00

STEEL JOISTS FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Open-web steel joists with bridging and attached bearing plates.

B. Related Sections:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 05 12 00 - Structural Steel Framing.
3. Section 05 31 00 - Steel Decking.

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Shop drawings shall indicate joist type, number, size, spacing, bridging, connections and erection details.

1.3 QUALIFICATIONS

A. Manufacturer shall be a member of S.J.I. and shall have engaged in the design and manufacture of similar units for a period of not less than 5 years.

B. Installer shall have minimum 2 years experience in similar sized projects and all welders shall be certified using AWS testing procedures.

1.4 QUALITY ASSURANCE

A. Reference Standards: The term "Standard Specifications" as used refers to latest editions of "Standard Specifications for Open Web Steel Joists" and "Standard Specifications for Longspan Steel Joists" as adopted by the Steel Joist Institute.

B. Erection Tolerances: Sweep in joists when erected shall not exceed ⅛" per foot of length.

C. All exposed steel joists shall comply with the finish requirements for “Architectural Exposed Steel”.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Joists: Open web, parallel chord, load carrying members of hot-rolled or cold-formed steel designated and fabricated in accordance with the "Standard Specifications".
1. Joists shall be cambered and shall fulfill their design requirements.
2. Joist bottom chords shall be double angles.
3. Provide extended ends for top chords of joists where indicated.

B. Shop Paint: SSPC-Paint 15, Type I, red oxide; Fed. Spec. TT-P-636, red oxide; or manufacturer’s standard shop primer complying with performance requirements of either of these red-oxide primers.

C. Welding Materials: AWS D1.1; type required for materials being welded.

D. Joist Accessories: ASTM A 36 quality for bridging, sidewall anchors, joist leg extensions and wall connectors as required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Erecting Joists: Set joists to spacing shown with bearing areas in accordance with the "Standard Specifications". Provide headers, trimmers and bearing plates.
   1. Anchor ends of joists to masonry supports with bar anchors, bolts, or welding.
   2. Anchor ends of joists to steel supports by welding.
   3. Before construction loads are applied, align the joists as shown on the drawings and install bridging and bridging anchors.
   4. Repair or replace any damaged joists.

B. Coordinate placement of anchorages in masonry construction for securing bearing plates.

C. Field weld joist seat to placed bearing plates after alignment and positioning are complete. Execute welding in accordance with AWS standards by welders who have been previously qualified for positions and base metals encountered.

D. Do not permit erection of decking until joists are braced and bridged.

E. Do not field cut or alter joists without approval of Architect/Engineer.

F. After erection, prime welds, abrasions and surfaces not primed. Use primer consistent with shop coat.

G. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.2 ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼".

B. Maximum Offset From True Alignment: ¼".

3.3 FIELD QUALITY CONTROL

A. Inspection and Testing: Verification inspection and testing of all field connections shall be done by an Independent Testing Laboratory, and copies of the inspection and test reports shall be submitted to the Architect, Engineer, City, Owner and Contractor. The cost of these inspections and tests shall be paid as specified in SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

B. High-Strength Bolted Connections: All bolted connections shall be visually inspected in accordance with manufacturer's specifications.

C. Welded Connections: All field welds shall be visually inspected in accordance with the applicable parts of AWS D1.1 Section 6, Inspection.

END OF SECTION

SECTION 05 31 00

STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Steel floor decking, **[mezzanine decking,]** and roof decking.

B. Related Sections:
1. Section 05 12 00 - Structural Steel Framing.
2. Section 05 21 00 - Steel Joists Framing: Structural framed openings larger than 18".
3. Section 05 50 00 - Metal Fabrications: Framing deck openings with miscellaneous steel shapes.

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Indicate type of deck, gage and finish of metal, and shape and size of special pieces and accessories. Indicate fastening to supporting structure and side lap fastening.

1.3 QUALITY ASSURANCE

A. Manufacturer: Shall have a minimum of 5 years experience in the design and manufacture of metal deck units.

B. Installer: Company specializing in performing the work of this section with minimum 3 years documented experience.

C. Welders must show proof of certification within the last year prior to starting any welding on the project. Welders and welding procedures shall comply with the requirements of ANSI/AWS D1.3 Structural Welding Code or as shown in the Steel Deck Institute Manual of Construction with Steel Deck.

D. **Label Construction: Floor deck units shall be Listed by Underwriters Laboratories as a "Steel Floor and Form Unit" and shall bear the UL Classification Marking.**

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS.

B. Store decking under provisions of SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIRE-MENTS on wood sleepers with slope for positive drainage.

1.5 COORDINATION

A. Coordinate installation with structural steel erection. Do not proceed until structure is ready to receive metal decking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers; Subject to compliance with requirements, provide products by the following:
Canam United States; Canam Group, Inc.
Nucor Corp.; Nucraft Division

2.2 MATERIALS

A. Floor Decking: Provide 24 gage non-composite steel form deck, 2-1/2" pitch by nominal 9/16" deep. Product/ manufacturer; one of the following:
P-3012; Canam Group, Inc.
Type No. .6C24 Conform Form Deck; Nucor Corp.; Vulcraft Division

B. Roof Decking: Provide 1-1/2" deep 22 gage wide rib deck units with ribs spaced 6" o.c. Deck plate shall have a flat surface; ribbed top flange is not acceptable. Product/manufacturer; one of the following:
P-3606; Canam Group, Inc.
Type 1.5B Roof Deck; Nucor Corp.; Vulcraft Division

C. Roof Decking at Gymnasium Area: Provide 3" deep x 22 gage acoustical steel deck units with ribs spaced 8" o.c. Product/manufacturer: Type NIA; Roof Deck; Nucor Corp.; Vulcraft Division

D. Roof Decking at Fly Loft: Provide 3" deep 22 gage Type NI.

E. Finish: Floor, **mezzanine**, and roof decking units shall have a light commercial class zinc coating in accordance with ASTM A 653, Class G60.

2.3 ACCESSORIES

A. Fasteners: Galvanized hardened steel.

B. Weld Washers: Mild steel, uncoated 3/4" outside diameter, 1/8" thick.

C. Screws: #10 x 3/4 - HWH TEKS/1 self-drilling screw manufactured from galvanized heat treated carbon steel as manufactured by "Buildex".

PART 3 - EXECUTION

3.1 ERECTION

A. Placement: Place steel deck units on the supporting steel framework and adjust to final position before fastening permanently. Bring each unit to proper bearing on the supports. Place the units in straight alignment and with a minimum of clearance between the ends of abutting units. Deck units shall be continuous over at least three spans.

B. Fastening: Weld deck units to steel framework at ends and at intermediate supports with 3/4" diameter fusion welds. Space welds as indicated on structural drawings.
1. Fasten side joints of roof decking together at mid-span with No. 10 self-tapping screws.
2. Fasten side joints of floor decking together by tack welding or mechanical crimping.

C. Opening: As the steel deck units are erected, cut and form the holes and openings which are located and dimensioned on the drawings. Holes required for the work of the other trades will be cut by the trades requiring them. Provide deck reinforcing for openings as recommended by the manufacturer.

3.2 FIELD QUALITY CONTROL

A. Inspection and Testing: Verification inspection and testing of all field connections shall be done by an Independent Testing Laboratory, and copies of the inspection and test reports shall be submitted to the Architect, Engineer, City, Owner, and the Contractor. The cost of these inspections and tests shall be paid as specified in SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior non-load-bearing wall framing.
2. Interior non-load-bearing wall framing.
3. Interior load-bearing wall framing.
4. Floor joist framing.
5. Soffit framing.
6. Cold-formed steel angles at wall openings and copings.

B. Related Sections:
1. Section 05 12 00 - Structural Steel Framing.
2. Section 05 50 00 - Metal Fabrications: steel angles.
3. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System.
4. Section 07 42 13 - Metal Wall Panels.
5. Section 07 48 00 - Rainscreen Attachment System (MFI)
6. Section 09 21 16 - Gypsum Board Assemblies: non-loadbearing partition studs.

1.2 SYSTEM DESCRIPTION

A. Masonry Veneer: The exterior non-load-bearing curtain wall system shall be designed to withstand both positive and negative pressure with a maximum deflection of L/600 of stud span. If stud span for 6" and 8" 18 gage stud exceed L/600, either increase stud gage, decrease stud spacing, or add light-gage bracing to control deflection to L/600.

B. Plaster, EIFS, and DEFS: The exterior non-load-bearing curtain wall system shall be designed to withstand both positive and negative pressure with a maximum deflection of L/360 of stud span. If stud span for 6" and 8" 18 gage stud exceed L/360, either increase stud gage, decrease stud spacing, or add light-gage bracing to control deflection to L/360.

C. All Other Veneer/Cladding: The exterior non-load-bearing curtain wall system shall be designed to withstand both positive and negative pressure with a maximum deflection of L/240 of stud span. If stud span for 6" and 8" 18 gage stud exceed L/240, either increase stud gage, decrease stud spacing, or add light-gage bracing to control deflection to L/240.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site prior to commencing Work. Attendees shall include Architect’s Structural Engineer, Cold-Formed Metal Framing Engineer, Cold-Formed Metal Framing Installer, and Owner’s Testing Lab.

1.4 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include manufacturer's specifications, load tables, dimension diagrams, anchor details, installation instructions for products to be used in lightgage framing work, and type and location of fasteners. Describe materials and finish, product criteria, and limitations.

B. Structural Calculations: Submit structural calculations prepared by manufacturer for review by project engineer.
1. Description of design criteria.
2. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application. This shall include cold-formed steel angles around exterior glazing system openings, exterior door openings, and exterior louver openings as detailed.
3. Selection of framing components and accessories.
4. Verification of attachments to structure and adjacent framing components.
5. Sealed by a professional engineer registered in the state where the project is located.

6. Engineer shall have a minimum of 5-years' experience with projects of similar scope.

C. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Drawings shall incorporate fabrication and erection details.

D. Evaluation Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. All structural members shall be designed in accordance with AISI "Specifications for the Design of Cold-Formed Steel Structural Members", latest edition.

B. Qualifications: Welders and welding procedures shall comply with the requirements of ANSI/AWS D1.3 Structural Welding Code.

1.6 DELIVERY AND STORAGE

A. Protect metal members from rusting and damage. Deliver to project site in manufacturer's containers or bundles, fully identified with name, brand, type and grade. Store off the ground in a dry, ventilated space.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lightgage Steel Framing: Basis of Design ClarkDietrich Building Systems (phone 800.543.7140 web site: www.clarkdietrich.com). ASTM A 1003, Provide Metal Framing, 18 gage minimum with 1-5/8" flange minimum, structural stud framing members. Refer to structural drawings for specific size, type, and locations of framing which may be used on the project.

B. Substitutions: Under provisions of SECTION 01 62 00 - PRODUCT OPTIONS. Other acceptable manufacturers with products of equal substance and function include:
CEMCO Steel
Mill Steel Company
The Steel Network

C. Furnish bridging and bracing members shown or required for a complete and structurally sound installation.

D. Track: Formed steel; channel shaped; same width and finish as studs, tight fit; 18 gage thick, solid web.

2.2 ACCESSORIES

A. Slide Clips: ASTM A 653, Grade A, galvanized metal clip.
1. ASTM A 653, Grade C, galvanized metal clip.
2. Designed and manufactured for attachment of metal stud framing to edge of structural steel framing.
3. Permits differential vertical movement between stud and floor or roof structure.
4. Clip and its connection to structure shall be adequate to safely brace metal studs to resist design lateral load of at least 330 pounds (allowable stress increase permitted by Building Code already taken into account).

B. Bracing and Furring: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

C. Bridging: 1-1/2" C.R. channels, 16 ga; same finish as framing members.

D. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

E. Galvanizing Repair Paint: Organic Zinc-Rich coating containing 95% metallic zinc, by weight in the dried film; recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to Federal Specification DOD P-21035A for repair of hot-dip galvanizing; as

manufactured by ZRC Worldwide (phone 800.831.3275 web site: www.zrcworldwide.com). Provide Z.R.C. Cold Galvanizing Compound.

F. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

G. Glazing System, Door and Louver Perimeter Angle, and Coping Nailer Support Angle:
1. This shall include cold-formed stainless steel angles around exterior glazing system openings, exterior door openings and exterior louver openings as detailed at stud, CMU and concrete walls.
2. This shall include continuous cold-formed steel support angles supporting wood nailers at copings and other similar conditions as detailed at stud, CMU and concrete walls.
3. Fabricate perimeter angle and coping nailer support angle from ASCE/SEI 8-02, Type 304 stainless steel sheet.

H. Supplementary Framing: Fabricate other steel-framing accessories from ASTM A 1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

I. Slotted Top Track: Basis of design shall be MaxTrak (SLT) Slotted Deflection Track System, as manufactured by Clark Dietrich or approved equivalent.
1. 16 gage, ASTM A 653, Grade 50 with a minimum yield point of 50,000 psi.
2. 2-1/2" down-standing legs with 1/4" wide by 1-1/2" high slots spaced at 1" on center.
3. Track width shall match stud size by manufacturer's standard length.
4. Fasteners: ASTM C 1002, self-drilling, self-tapping screws.

2.3 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: ASTM A 90, hot dip galvanized.

B. Anchorage Devices: Power driven as recommended by manufacturer for size and spacing.

C. Welding Electrodes: Comply with AWS standards D1.1 and D1.3.

D. Post-Installed Anchors (for securing perimeter angle to masonry or concrete structure): Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate; zinc coated by hot-dip process according to ASTM A 153, Class C.

2.4 FABRICATION

A. General: Framing components may be prefabricated into panels prior to erection. Cut framing components accurately to fit squarely against abutting members. Hold members firmly in position until properly fastened. Prefabricated panels shall be square and braced against racking. Attach similar components by welding.

B. Protective Finishing: Paint abraded surfaces and welds after fabrication, using galvanizing repair paint for galvanized surfaces.

2.5 FINISHES

A. All framing members shall be formed from hot-dip galvanized steel, G90 (Z275) coating, conforming to the requirements of ASTM A 1003, Structural Grade, Type H.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel framing members and accessories in accordance with the manufacturer's instructions and the erection drawings. Spacing of studs shall not exceed 16" o.c.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

C. Securely anchor track to floor and overhead structure or member. Seat studs squarely in the track with the stud flange securely attached to the flanges of both upper and lower track.
   1. Attach structural components by welding, bolting or with self-drilling screws.
   2. Wire tying of framing components in structural applications will not be permitted.

D. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thinness of 2.0 mils. For galvanized surfaces, apply galvanizing repair paint.

E. Construct corners using minimum three studs. Double stud at wall opening, door, and window jambs.

F. Provide vertical stud within 12 inches of jamb for brick anchor attachment at openings. Reference BIA Technical Note 28B.

G. Provide rows of horizontal bridging welded in place at spacing recommended by stud manufacturer to resist lateral forces and stud rotation.

H. Slotted Top Track: Install slotted track in strict accordance with manufacturer's written instructions and recommendations.
   1. Secure studs to slotted top track with #8 wafer-head screws.
   2. Maintain minimum deflection gap of 0.65 inch between top of stud and top of slotted track.
   3. Limit vertical movement to 1 inch, plus or minus 1/2 inch.

3.2 TOLERANCES

A. Maximum Variation from True Position: ±1/8" from plan location.

B. Maximum Variation of any Member from Plane: 1/8" in 10 feet.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Miscellaneous metal work and related items.

B. Related Sections:
1. Section 05 12 00 - Structural Steel Framing.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails:
a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Top Rails of Guards:
a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.
3. Infill of Guards:
a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

B. Structural Performance of Ladders: Provide ladders and ship's ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

1.3 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include details of each metal fabrication, including setting drawings for anchor bolts and other required anchors.

B. Submit structural calculations prepared by manufacturer for review by project engineer. Shop drawings and calculations shall be sealed by a professional engineer registered in the State of Texas.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: ASTM A 36, shapes, plates and bars.

B. Threaded Fasteners: ASTM A 307, Grade A, bolts and nuts.

C. Stud Anchors: Provide headed stud anchors with a smooth shank of carbon steel with a minimum tensile strength of 60,000 psi, as manufactured by Nelson Stud Welding Div. or KSM Welding Systems Div.

D. Expansion Bolts: Fed. Spec. FF-S-325, Group II, Type A, Class 1. Provide Hilti Kwik-bolt or Ramset Trubolt stud anchors.

E. Galvanizing Repair Paint: Organic Zinc-Rich coating containing 95% metallic zinc, by weight in the dried film; recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to Federal Specification DOD P-21035A for repair of hot-dip galvanizing; as manufactured by ZRC Worldwide, Marshfield, MA (phone 800.831.3275 web site: www.zrcworldwide.com). Provide Z.R.C. Cold Galvanizing Compound.

F. Stainless Steel: Grade and type designated below for each form required:

1. Pipe: ASTM A 312, Grade TP 304.
2. Tubing: ASTM A 312, Grade MT 304.
3. Castings: ASTM A 743, Grade CF 8 or CF 20.
4. Plate and Sheet: ASTM A 240 or ASTM A 666, Type 304.
5. For stainless steel railings, provide fasteners fabricated from type 304 stainless steel.

2.2 FABRICATION

A. Fabricate and assemble metal work in the shop to the greatest extent possible.
   1. Metal surfaces shall be clean and free of mill scale and rust pitting, well-formed to shape and size with sharp lines and angles. Shearing and punching shall leave clean true lines and surfaces. Exposed ends and edges shall be milled smooth with corners slightly rounded.
   2. Weld shop connections to the extent practical; finish exposed welds smooth. Weld joints shall be flush.
   3. Cut, drill or punch holes; do not make or enlarge by burning. Provide holes where required for connecting the work of other trades.
   4. Conceal fastenings where practical. Thickness of metal and method of assembly and support shall give ample strength and rigidity.
   5. Assemble parts so that joints are tight, members are in good alignment, and the finished work reproduces the drawing details as intended.
   6. Stud Anchors: Weld stud anchors to miscellaneous shapes using welding equipment and procedures recommended by the manufacturer of the stud anchors used.

B. Punching: At hollow structural sections located in the exterior building envelope, provide shop-punched holes in steel sections as indicated on drawings, for installation of sprayed foam insulation to completely fill hollow structural section cavity.

C. Shop Painting:
   1. Carbon steel surfaces shall be cleaned, degreased, and shop coated with a straight alkyd, zinc chromate, rust inhibitive paint applied by brush or spray. Steel to be encased in concrete need not be painted.
   2. Aluminum surfaces to be in direct contact with concrete and masonry shall be shop coated with zinc chromate primer.

D. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
   1. ASTM A 153 for galvanizing iron and steel hardware.
   2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip ⅛" thick and heavier, and for galvanizing assembled steel products.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Deliver, store and erect metal work in such manner that the parts are not damaged or deformed. Install the work true to line, plumb, level, in proper alignment with other work, and free of sags, buckles and other objectionable defects. Anchorage shall be adequate to safely resist all stresses to which the work will normally be subjected.

B. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils. For galvanized surfaces, apply galvanizing repair paint.

3.2 MISCELLANEOUS METAL SCHEDULE

A. General: The following is a general list of the metal work to be furnished under this section of the specifications. Other items of miscellaneous metal work shown and noted on the drawings and not mentioned elsewhere in the specifications shall be furnished as though specifically described herein.

B. Loose Lintels: Lintels of steel shapes and plates where required at exterior brick veneer and as detailed.
   1. End bearing shall be at least 8".
   2. Where steel lintels are not specifically called out, furnish at least one steel angle for each 4" thickness of masonry in the wall.
   3. Wrap bearing ends of lintels with flashing to achieve a bond breaker between the lintel and the masonry.

4. Galvanize steel lintels located in exterior walls.

C. Pipe Rails: Handrails and railings of standard black steel pipe with fittings as detailed.
1. Bend pipe to smooth curves without kinks. Make joints and connections flush and smooth. Grind rough edges and exposed welds smooth; dress to profile.
2. For railings, space the posts as shown but not more than 4 ft. apart. Install posts into pipe sleeves set in the concrete; grout each post tight with low viscosity epoxy grout.
3. Provide slip flanges where posts are set into concrete and where rails terminate against walls.
4. Railings shall be designed and installed to meet loads and stresses as referenced in “Performance Requirements” Article within this specification section.
5. Thermal Movements: Allow for expansion, contraction, and thermal movements of members and building movement from ambient (120deg F) and surface (180deg F) temperature changes without damage to connections or members.
6. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2" beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6" of post.
7. For wall mounted handrails, provide malleable iron brackets having the mounting hole countersunk for a flat head machine screw to finish flush with the surface. Space brackets not more than 4 ft. apart. Fabricate returns from plates and welding elbows. Anchor returns and brackets with built-in anchor plates.
8. Handrails shall extend a minimum of 12" beyond the top riser of a stair and the top and bottom of a ramp. Handrails shall extend one tread width beyond the bottom riser of a stair.
9. Galvanize exterior pipe handrails and railings after fabrication.

D. Roof Curbs: Fabricate curbs of steel angles, channels and plates at roof openings for ducts, exhaust fans and other set-on items.
1. Miter and weld corners.
2. Bolt or weld curbs to roof framing members.

E. Storefront Bracing: Provide braces of steel angles, channels and plates to reinforce and stiffen the head of the aluminum storefront framing.

F. Track Supports: Provide framing and brackets of steel shapes as detailed to support curtain track, and folding panel partition.
1. Erect to be level, straight and rigid.
2. Punch for mounting bolts as required.

G. Cast Iron Gratings: Standard duty cast iron gratings and frames of the type and size detailed for the concrete catch basins and tree grates.
1. Set frames flush with the concrete and loose in the frames at catch basins.

H. Areaway Steel Grating: Provide the following steel grating at areaways:
McNichols #GW-75 Galvanized grate

I. Ladders: Fabricate ladders of steel bars and shapes.
1. Weld all connections.
2. Bolt ladders to floor and wall with steel brackets and clips.
3. Ladder Rungs: Provide SlipNOT®, grit-free, mill finish steel Grade #2 – Medium rungs as manufactured by the W.S. Molnar Company (1-800-SlipNOT) or approved equivalent. Reference drawings for dimensions. Steel shall incorporate an anti-slip primarily martensitic steel surface covering 100% of the substrate consisting of a random hatch matrix with a surface hardness between 55 – 63 on the Rockwell “C” scale and a surface to substrate bond strength of at least 4,000 psi. The non-slip surface shall have a minimum coefficient of friction of 0.8 and be listed as slip resistant by Underwriters Laboratories.
4. Galvanize exterior ladders after fabrication. Reference Manufacturer’s galvanizing guidelines, as to not damage the anti-slip surface.
5. Fall Arrest System: Provide 3M™ DBI-SALA® Lad-Saf™ Cable Vertical Safety System as manufactured/provided by Rooftop Anchor, Inc.
a. Provide on ladders 24 feet in length or longer. Also provide at ladders where any portion occurs a minimum of 24 feet above finish floor, surface, or grade.
b. This system is a 2-user, stainless steel vertical safety system (vertical lifeline) that meets the new ANSI Z359.16 standard, along with OSHA 1910.140 and 1926.502, when used with the Lad-Saf X3 Detachable Cable Sleeve (6160054) and Lad-Saf X2 Detachable Cable Sleeve (6160030). It includes the top and bottom brackets and 20’ of swaged 3/8 inch 1×7 galvanized steel cable.

J. Aluminum Ships Ladders: As manufactured by O'Keeffe's Inc. (415) 824-4900
   1. Ship Ladder: Provide Model Number 520
      a. Rungs no less than 1-1/4" high, 4-1/8" deep and 2'-0" wide.
      b. Tread spacing shall be 1'-0" on center and angle of rise shall be 75 deg., as shown on drawings.
      c. Channel Side Rails: Shall be no less than 1/8" wall thickness by 2" x 6".
      d. Handrails shall be aluminum pipe, no less than 1-1/2" in diameter, with hemispherical aluminum end caps.

K. Bollards: Provide bollards of size indicated, extend 3' below grade and 4' above grade, fabricated of Schedule 40 steel pipe, galvanized with G90 coating. Fill bollards with 3000 psi concrete, finish with domed top.
   1. At existing slabs, fabricate bollards with 3/8-inch-thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
   2. Removable Embedded: Reference SECTION 32 33 05 - ARCHITECTURAL SITE FURNISHINGS.

L. Gates: Provide gates of structural steel tubing of the sizes and spacing as detailed. Miter corners and weld all connections.
   1. Frame: Structural steel plate as detailed.
   2. Installation: Frame shall be anchored to masonry wall with adjustable anchors to fit masonry joints. Install hardware and hang the gates. Adjust gates to operate smoothly and easily. Make gates secure against entry when locked.
   3. Galvanize gates after fabrication.

M. Fence: Provide fence of steel tubing and channels of the size, shape, and spacing as detailed.
   1. Miter corners and weld connections.
   2. Installation: Fence to be erected plumb and straight.
   3. Galvanize fence after fabrication.

N. Brick Vents: Provide aluminum brick vents 2-1/2"W x 3-5/8"D x length indicated on drawings, as manufactured by Construction Specialties, Inc.

O. Roof Edge Angles: Provide steel angles along roof edges to support wood nailers.
   1. Weld angles to steel framing unless otherwise indicated.

P. Folded Metal Soffit Ventilating Plate: Form from 0.032 gauge aluminum perforated sheet, 1/16" round perforations, as manufactured by McNichols Co. - (phone 800 237-3820).

Q. Metal Bar Gratings: 3/16" wide bars at 15/16" o.c., welded steel grating meeting "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" as published in ANSI/NAAMM A202.1 "Metal Bar Grating Manual".
   1. Surface: Plain
   2. Finish: Hot-dipped galvanized.

R. Downspouts: 6" x 6" x 3/16" thick steel tubing fabricated per details.
   1. Hot-dip galvanized, paint grip G90, entire assembly per ASTM A 123 Class B-1, with a minimum of 0.2 oz. per sq. ft. surface.

S. Perforated Metal Screens with Graphics (Refer to drawings for locations):
   1. Provide prefinished aluminum, .1250 thick (8 ga), perforated aluminum panel screens. The perforations, staggering and openness shall be as selected by Architect.
   2. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A 123 to 2.0 oz/sq ft.
   3. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.
   4. Aluminum Finish:
      a. Finish coating will meet or exceed test requirements of AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
      b. Architect shall select from full range of standard manufacturers, Valspar Fluropon and PPG Duranar colors.
         1) Pretreatment – The aluminum shall be thoroughly cleaned using a multi-stage cleaning process to remove organic and inorganic surface soils and residual oxides. Apply a chemical conversion coating to which organic coatings will firmly adhere.
         2) Primer – The cleaned and treated substrate shall be primed to a thickness of 0.2 – 0.3 mils using approved factory application methods.

3) Paint – The paint system shall contain 70% PVDF (Hylar 5000® or Kynar 500®) resin and durable ceramic pigments. It shall be factory applied and oven baked for a topcoat film thickness of 1.0 mil minimum.
4) Clear topcoat, shall be applied at 0.4 – 0.8 mils.

T. Structural Steel Door Frame for Jamb Mounted Rolling Doors: Frames of carbon steel shapes, bars and plates, fully welded, uniform, square, and true, as detailed for the rolling doors.
1. Miter and weld corner joints and grind exposed welds smooth.
2. Weld 14 gage strip anchors to frame jambs, spaced 24" o.c. to work masonry bed joints.
3. Continuously weld exposed joints; grind exposed welds smooth.
4. Provide necessary reinforcements and drill and tap as required for finish hardware.
5. Provide steel strap anchors for securing door frames into adjoining masonry. Weld anchors to frame jambs no more than 12" from both bottom and head of frame and space anchors not more than 30" apart.
6. Galvanize exterior structural steel door frames and anchors.

U. Stainless Steel Railings: Railings of square and round stainless steel tubing and steel plate as detailed for Serving Area in Kitchen.
1. Rails shall be 2" x 2" x 0.065" wall square stainless steel tubing, No. 4 finish.
2. Posts shall be 1-1/4" O.D. x 11-gage round stainless steel tubing, No. 4 finish.
3. Shop connections shall be electrically welded to the extent practical using stainless steel welding rods. Grind and polish welds to the original finish of the metal and remove weld discolorations on exposed surfaces by electro-chemical methods.
4. Bend tubing to smooth curves without kinks or distortions. Make joints and connections flush and smooth.
5. All exposed mechanical fasteners used in the assembly of the railings shall be stainless steel.

V. Cast Iron Downspout Boots: Provide cast iron downspout boots as manufactured by J.R. Hoe, 800-245-5521, www.downspoutboots.com or approved equivalent. Provide sizes and configurations indicated on drawings. Boots shall be factory primed.

W. Trench Covers: Provide cast iron, heavy duty trench drain and cover, # TGMB-10 x 10 LF, as manufactured by McKinley Iron Works.

X. Miscellaneous Steel Shapes: Channels, wide flange shapes, angles, plates, tubing, connections, and bolts where shown and detailed on Drawings. Hot-dip galvanize where exposed to weather or touching exterior masonry after fabrication. Set mechanical unit frames directly on joists, not on deck. Provide an angle frame supported by structure around all roof penetrations including hatches and ductwork.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Framing with dimension lumber, wood blocking and nailers, wood furring and grounds, plywood sheathing, subflooring and plywood backing panels.

B. Related Sections:
1. Section 06 40 00 - Architectural Woodwork.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Product Data:
1. Include all data for rough carpentry products required for installation.
2. Fire-retardant-treated wood product data, including certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

C. Warranty: Provide warranty of chemical treatment manufacturer for each type of treatment.

1.3 QUALITY ASSURANCE

A. Lumber Grading: Lumber Grading Rules and Wood Species in accordance with Voluntary Product Standards. Grading rules of following associations apply to materials furnished.
1. Southern Pine Inspection Bureau (SPIB).
2. West Coast Lumber Inspection Bureau (WCLIBB).
3. Western Wood Products Association (WWPA).

B. Grade Marks: Identify lumber and plywood by official grade mark.
1. Lumber: Include symbol of grading agency, mill name, grade, species, grading rules and condition of seasoning at time of manufacturer.
2. Plywood: Include type, span rating or group number, exposure durability classification, and agency mark of APA.

1.4 QUALIFICATIONS

A. Design structural site fabricated items under direct supervision of a professional structural engineer experienced in design of this work and licensed in the State of Texas.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Store products above ground, on platforms or skids, and covered with waterproof coverings. Provide for adequate air circulation.

C. Do not store seasoned materials in damp or wet locations.

D. Support products in such a way as to prevent warping and distortion.

1.6 WARRANTY

A. Provide a 20-year warranty for each type of chemical treatment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood: Lumber for framing and general carpentry work shall be sound, well manufactured, surfaced S4S material with a moisture content limit of 19%.
   1. Dimension: SPIB grade marked No.2 Dimension Southern Pine or WCLB grade marked No. 2 Dimension Douglas Fir.
   2. Boards: SPIB grade marked No. 2 Boards Southern Pine.
   3. Redwood: RIS grade marked Construction Heart California Redwood.

B. Plywood: Plywood for general carpentry work shall be APA trademarked, 23/32" minimum thickness, Tongue & Groove.
   1. Interior: APA Rated Sturd-I-Floor, 24 oc, Exposure 1, fire-retardant treated.
   2. Exterior: APA Rated Sturd-I-Floor, 24 oc, Exterior, fire-retardant treated.

C. Rough Hardware:
   1. Anchors, bolts, screws, and spikes shall be of proper types and sizes to support the work, to draw the members into place, and to hold them securely. Bolt heads and nuts bearing on wood shall have standard washers.
   2. Metal fasteners to secure wood grounds and blocking to masonry and concrete shall be of the type best suited to the conditions and spaced no more than 16" o.c. Wood plugs and nailing blocks are not acceptable.
   3. Nails shall be of the sizes and types intended for the particular use.
   4. Rough hardware exposed to the weather or embedded in exterior masonry and concrete walls or slabs shall be hot-dipped galvanized.
   5. Nails and bolts used with preservative treated lumber shall be hot-dipped galvanized.

2.2 WOOD TREATMENT

A. Preservative Treatment:
   1. Comply with applicable requirements of AWPA U1; Category UC2 for interior construction not in contact with ground, Category UC3b for exterior construction not in contact with ground, and Category UC4a for items in contact with ground.
      a. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
      b. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
   2. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19% for lumber and 15% for plywood. Do not use material that is warped or that does not comply with requirements for untreated material
   3. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

B. Fire-Retardant Treatment:
   1. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   2. Wood shall be fire-retardant chemically treated and pressure impregnated; with a flame spread index of 25 or less and a smoke development of 0-450 when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   3. Treatment shall not promote corrosion of metal fasteners.
   4. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
   5. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   6. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841

7. Kiln-dry lumber and plywood after treatment to maximum moisture content of 19% for lumber and 15% for plywood.
8. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

C. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of lumber or plywood after drying; discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
1. Discard units of material with defects which might impair quality of work, and units which are too small to fabricate work with minimum joints or optimum joint arrangement.
2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted. Scribe and cope as required.
3. Securely attach carpentry work to substrates by anchoring and fastening as required by recognized standards and as required to draw members into place and securely hold same unless otherwise indicated. Use washers under all bolt heads.
4. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.
5. Make tight connections between members to develop full strength of members.
6. Install fasteners without splitting of wood.
7. Pre-drill as necessary.
8. Comply with APA E30 requirements for plywood.
9. Install fasteners at spacings recommended by AFPA National Design Specifications for Stress Grade Lumber and Its Fastening - 1973 for lumber and APA Guide E30 for Plywood, unless more restrictive code requirements dictate tighter spacing or heavier fasteners.
10. Locate members as indicated on the drawings. Size, spacing or spans shall not be changed without specific approval of Architect. Take care to place proper grades and species of members where indicated in accordance with the lumber schedule herein.
11. Temporary brace framing at the end of each days' work until all framing is completed and securely anchored. Leave temporary bracing in place as long as required for safety. As work progresses, securely connect work to compensate for dead load, wind and erection stresses.

B. Framing: Frame members properly; fit closely, set accurately and secure rigidly in place. Do not splice between bearing points. Do not use shims for leveling on wood and metal bearings. Slate or tile shims may be used for leveling on masonry and concrete.
1. Stud walls and partitions shall have single bottom plates bolted to the concrete not more than 4 ft. o.c. and double top plates with staggered joints. Space studs on 16" centers. Double the studs at all openings. At masonry walls, bolt the end studs to the masonry.
2. Spike beams and joists to wood bearings and at lapped ends. Frame headers and trimmers around openings, making allowance for passage of pipes and ducts to avoid injurious cutting of structural members.
3. Framing shall be closely fitted, accurately set to the required lines and levels, and securely spiked and bolted in place. Provide all bracing required to obtain rigid structures.

C. Plywood Paneling: Arrange in uniform width.
1. Install in full lengths without end joints.
2. Install with uniform end joints. Locate end joints only over furring or blocking.
3. Fasten paneling with trim screws, set below face and filled.

D. Shoring: Construct shoring for masonry where required. Brace and maintain it until the mortar has set sufficiently to permit removal.

E. Blocking: Install 2x6 wood blocking between studs to stiffen the structure and for the support of other work. Provide 2x6 blocking for installation of wall-mounted objects.

F. Nailers: Install nailers of adequate size where detailed. Nailers shall be bolted in place. Where bolt sizes and spacing are not specifically noted, use not less than ⅜" bolts at 32" o.c., staggered.

G. Roof Curbs: Construct wood curbs as detailed to frame openings and support flashings in roof decks.

H. Bucks: Install wood bucks for frames as required. Members shall be at least 2 x 4 material. Spike securely together. In masonry, provide 16 ga. corrugated metal jamb anchors screwed to the back and spaced to work masonry bed joints, not more than 32" apart.

I. Bridging: Install cross-bridging between wood joists where the span exceeds 8 ft. Use 1 x 4 material and bevel cut the ends to fit. Drive tight and double nail each end.

J. Roof Decking: Install plywood decking where detailed with the face grain perpendicular to supports and spanning minimum two spans. Locate ends over supports and leave 1/8" spacing between all panel ends and edges. Use "HILTI" (EDN) pins at 12" o.c. at intermediate supports and 6" o.c. at panel ends. Installation shall meet FM-90 Up-Lift Rating.

K. Plywood Backing Panels: Screw attach through gypsum board to supports.

3.2 PROTECTION

A. Protect products from moisture absorption and subsequent warping or deterioration until subsequent construction can proceed.

END OF SECTION

SECTION 06 16 56

AIR- AND WATER-RESISTIVE SHEATHING BOARD SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vapor-permeable, air- and water-resistive wall sheathing.
2. Site-fluid-applied, vapor-permeable air barrier flashing.
3. Accessories.

B. Related Sections:
1. Section 01 45 00 - Quality Control: for general mockup requirements.
2. Section 01 45 23 - Testing and Inspection Services: for coordination with testing agency.
3. Section 05 40 00 - Cold-Formed Metal Framing: for structural framing support of panels.
4. Section 06 10 00 - Rough Carpentry: wood blocking and nailers.
5. Section 07 11 13 - Bituminous Dampproofing; behind below-grade masonry veneer and at non-conditioned buildings.
6. Section 07 27 26 - Fluid-Applied Membrane Air Barriers: air barrier on masonry backup.
7. Section 07 65 00 - Flexible Flashing: for flexible flashing components integrating with transition materials specified in this Section.
8. Section 07 92 00 - Joint Sealants: for backing materials.
9. Division 07 roofing Sections for roof assembly air barriers and interface coordination.
10. Section 09 21 16 - Gypsum Board Assemblies: for wall sheathing requirements for portions of the Work not requiring board product air barriers specified in this Section.

1.2 DEFINITIONS

A. Air barrier Accessory: A transitional component of the air barrier that provides continuity.

B. Air barrier Assembly: The collection of ABs and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

C. Air barrier Material (AB): Air tight barrier made of material that is relatively air impermeable but moisture vapor permeable, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.

D. Material Transitions: Areas where the WRB/AB fiberglass-mat gypsum sheathing connects to beams, columns, slabs, parapets, foundation walls, roofing systems, and at the interface of dissimilar materials.

E. Rough Openings: Openings in the wall to accommodate windows and doors.

F. Water-Resistive Barrier (WRB): Water-shedding barrier made of material that is moisture-resistant, and installed to shed water, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate installation of board product air barriers with framing installation and subsequent operations that impact finished envelope air barrier work.
2. Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.

B. Preinstallation Conference: Conduct conference at Project site.
1. Review board product air barrier accessory materials installation, including joints between sheathing boards and transitions to abutting construction including air barriers work of other Sections. Review requirements for forming and sealing penetrations of air barrier by other trades.
2. Review requirements for each type of air barrier product and installation, project and manufacturer's details, mockups, testing and inspection requirements, and coordination and sequencing of air barrier work with work of other Sections.

3. Review manufacturer's written instructions for meeting Project requirements for substrates specified, including three-dimensional video model demonstrating proper application of components at wall openings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of air barrier product assembly and accessory. Indicate assembly component materials and dimensions and include construction and application details.
   1. Include data for framing preparation instructions and recommendations.
   2. Include data for substrate preparation instructions and recommendations.
   3. Include data for air- and water-resistive sheathing board assembly product data.
   4. Include standard drawings illustrating manufacturer's written installation and finishing instructions applicable to Project, including details for joints, counterflashings, penetrations, terminations, and tie-ins to adjacent construction.

B. Shop Drawings: For locations and extent of WRB/AB system.
   1. Include details of typical conditions, special joint conditions, and intersections with other building envelope systems and materials.
   2. Include counter flashings and details showing bridging of envelope at substrate changes.
   3. Detail sealing penetrations, and flashing around windows and doors.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer**, testing agency,** and manufacturer.

B. Manufacturer Product Certificates: Indicate compliance with requirements of specified products under Performance Requirements or indicated on Drawings.

C. Fire-Propagation Characteristics Certificate: From a qualified testing agency, documentation that air barrier system as a component of a wall assembly has been tested or engineered to pass NFPA 285. Include system classification number of testing agency on Shop Drawings.

D. Product Certificates: Indicate compliance with requirements of specified products in "Performance Requirements" Article or as indicated on Drawings.

E. Product Test Reports: For each air barrier product, and air- and water-resistive sheathing board assembly, for tests performed by a qualified testing agency.

F. Sample Warranties: For manufacturer’s warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified air barrier manufacturer experienced in manufacture of air barrier as one of its principal products.

B. Installer Qualifications: An experienced entity that employs applicators trained in application of specified products.

C. Testing Agency Qualifications: Qualified independent agency experienced in installing specified waterproofing system, and qualified to perform observation and inspection specified in "Field Quality Control" Article to determine Installer's compliance with the requirements of this Project. Testing agency to be acceptable to Architect and retained by the **Owner**.

D. Mockups: Provide air barrier mockup application within mockups required in other Sections, or if not specified, in an area of not less than 64 sq. ft. of wall surface where directed by Architect for each type of backup wall construction. Include examples of surface preparation, crack and joint treatment, air barrier application, and flashing, transition and termination conditions. Build mockups to set quality standards for materials and execution.
   1. Include air barrier system tie-in details between walls and roof, and with wall and foundation wall. Include penetrations and openings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packaging and store in an enclosed shelter providing protection from damage and exposure to the elements.
   1. Store within temperature limits required by manufacturer.
   2. Store air- and water-resistive sheathing board supported on risers on a flat platform.
   3. Comply with manufacturer's written instructions requirements for safety and handling.

B. Discard liquid materials that cannot be applied within their stated shelf life.

C. Store accessory materials in a location with constant ambient temperatures of 40 to 80 deg F.

1.8 FIELD CONDITIONS

A. Cold Weather Conditions:
   1. Site Fluid-Applied, Vapor-Permeable Joint Flashing: Comply with manufacturer's cold weather application written instructions when atmospheric temperatures or substrate surface temperatures are less than 40 deg F.
   2. Accessories and Sealants: Comply with manufacturer’s cold weather application instructions when atmospheric temperatures or substrate surface temperatures are less than 40 deg F.

B. Exposure: Comply with manufacturer’s limitations on exposure of applied product.
   1. Do not apply air barrier joint flashing to sheathing surface that is frozen or has frost.

C. Protect adjacent substrates from environmental conditions that affect air barrier performance

D. Coordinate installation of membrane air barrier with completion of roofing, below grade, factory fluid-applied membrane portion to site fluid-applied membrane portion and other work requiring interface with air barrier.

E. Schedule work for inspection of air barrier applications prior to concealment.

F. Ensure ABs are cured before covering with other materials.

1.9 WARRANTY

A. Manufacturer's Warranty for Air Barrier System:
   1. Warranty Period for Air- and Water-Resistive Sheathing Board Assembly: Watertight for a period of ten years from date of Substantial Completion.

B. Manufacturer's Warranty for Site Fluid-Applied Air Barrier Products: Manufacturer agrees to furnish and install AB to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as a water-resistive barrier and air barrier, as defined in the applicable IBC and IECC, under normal use within specified warranty period.
   1. Manufacturer will, at its option, replace nonconforming Product or refund the purchase price of quantity of product shown to be nonconforming.
   2. Access for Repair: Provide air barrier system manufacturer with unimpeded pre- and post-occupancy access to Project facility and air barrier system for purposes of testing, leak investigation, and repair, and to reinstall removed cladding materials upon completion of repair.
   3. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain fluid-applied flashing materials and air barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air- and Water-Resistive Performance: Air- and water-resistive board assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier system and as a water resistive barrier flashed to direct incidental water to wall exterior, and interface with adjacent building air barrier system components.

1. Air- and Water-Resistive Board Assemblies: Capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations and transitions at perimeter conditions without deterioration and air-leakage exceeding specified limits.

B. Air Permeance of Sheathing: Maximum 0.04 cfm/sq. ft of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2178.

C. Air- and Water-Resistive Board Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

D. Water Penetration under Static Pressure: Test according to ASTM E 331, as follows:
1. No evidence of water penetration through air barrier board assembly when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 2.86 lbf/sq. ft.

E. Water Vapor Permeance; Panel Assembly: Minimum 10 perms (580 ng/Pa x s x sq. m) as tested according to ASTM E 96/E 96M, Procedure B.

F. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by a qualified testing agency.

G. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

H. Fire Propagation Characteristics: Provide air- and water-resistive board assembly qualified as a component of a comparable wall assembly that has been tested or engineered to pass NFPA 285.

2.3 WALL SHEATHING

A. Air- and Water-Resistive Sheathing Board: ASTM C 1177/C 1177M, glass-mat-faced gypsum sheathing board.
1. Basis-of-Design Product: Subject to compliance with requirements, provide DensElement™ Barrier System as manufactured by **Georgia-Pacific Gypsum LLC**.; or a comparable product by one of the following:
USG Corporation and Tremco; Securock ExoAir 430 System.
NO SUBSTITUTIONS.
2. Board Thickness: 5/8 inch thick.
3. Board Type: Type X.
4. Board Size: 48 by 96 inches for vertical and horizontal installations.
5. Air- and water-resistive Flashing Thickness: Minimum 16 mils wet film thickness.
6. Physical and Performance Properties:
a. Air Permeance; ASTM E 2178: Maximum 0.04 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference.
b. Water Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M, Procedure B.
c. Combustion Characteristics; ASTM E 84: Class A.
d. Board Product Antifungal Properties; ASTM D 3273: 10; zero defacement.
e. VOC Content - Fluid-Applied Flashing: 50 g/L or less.
f. UV and Weathering Resistance: Maximum 12-month exposure.

2.4 AIR BARRIER ACCESSORY MATERIALS

A. General: Provide compatible air barrier accessory materials furnished or recommended by air barrier manufacturer as required by Project conditions to produce a complete air barrier assembly identical to tested assemblies meeting performance requirements.

B. Joint Backing: See SECTION 07 92 00 - JOINT SEALANTS for backing materials.

C. Primer: Liquid primer recommended by air barrier manufacturer for exposed gypsum core edges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO, Inc.; PorousPrep Sealer.
2. Color: Blue.

D. Fluid-Applied Air Barrier Flashing: Site-applied for application to joints, fasteners, penetrations, openings and material transitions.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DensDefy Liquid Flashing as manufactured by Georgia Pacific Gypsum LLC.
   2. Color: Gold

E. Flashing and Transition Strip: Self-adhered membrane, 25 mils thick.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DensDefy Transition Membrane as manufactured by Georgia Pacific.

2.5 FASTENERS

A. Screws for Fastening Board Product Air barriers to Cold-Formed Metal Framing: Steel drill screws, ASTM C 1002, in length recommended by sheathing manufacturer for sheathing thickness.

B. Screws for Fastening Board Product Air Barriers to Wood Framing: Wood screws, ASTM C 1002, in length in accordance with sheathing manufacturer's written instructions for sheathing thickness

PART 3 - EXECUTION

3.1 EXAMINATION

A. Framing Examination: Examine framing to determine if work is ready to receive board product air barriers.
   1. Verify that surface flatness tolerances and framing spacing comply with Project requirements.
   2. Verify that adequate support is provided for sheathing board edges.
   3. Proceed with work once conditions comply with manufacturer's written instructions.

B. Adjacent Substrate Examination: Prior to installation of accessory materials, examine adjacent substrates to receive transition treatment.
   1. Verify that substrates are sound and free of contaminants, adequately cured or aged, compatible with proposed transition materials, and free of obstructions or impediments that would result in failure of transition adhesion and failure of air barrier assembly to perform according to Project requirements.
   2. Verify that concrete and masonry surfaces are visibly dry, cured, and free from release agents, curing agents, and other contaminates.
      a. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   3. Verify that masonry joints are filled with mortar and struck flush.

C. Proceed with installation once conditions comply with manufacturer's written instructions and only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat portions of work not requiring sheathing board substrate according to air barrier manufacturer's written instructions.
   1. Mask adjacent finished surfaces.
   2. Remove contaminants and film-forming coatings from substrates.
   3. Remove projections and excess materials; fill voids with substrate patching material.
   4. Prepare and treat joints and cracks in substrate according to air barrier manufacturer's written instructions.

B. Joints:
   1. Seal all sheathing joints with fluid-applied flashing approved by sheathing manufacturer.
   2. Fill gaps from 1/8 to 1/4 inch with a backer rod prior to applying fluid-applied flashing.
   3. Seal gaps greater than 1/4 inch with transition membrane and fluid-applied flashing approved by sheathing manufacturer.

3.3 INSTALLATION OF AIR- AND WATER-RESISTIVE SHEATHING BOARDS

A. Discard each air- and water-resistive sheathing board with damage that compromises continuity or impairs performance as an air barrier, and is unable to be repaired according to manufacturer's written repair instructions.
   1. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Comply with ASTM C 1280, GA-253, and manufacturer's written instructions.
   1. Fasten sheathing boards to **[wood] [cold-formed metal]** framing with specified screws in pattern indicated.
   2. Install sheathing boards with a 1/4-inch gap where they abut masonry or similar materials that might retain and transmit moisture to them.

C. Cut sheathing boards at penetrations, edges, and other obstructions of work to allow for application of air barrier accessory materials. Fit sheathing boards closely against abutting construction.

D. Install sheathing boards with long dimension perpendicular or parallel to framing. Abut ends and edges of sheathing boards centered over face of framing members. Offset sheathing boards joints by not less than one stud spacing.
   1. Apply sheathing boards in pieces sized to provide minimum number of joints and optimum sheathing board arrangement. Arrange joints so that pieces do not span between fewer than three support members.
   2. Do not bridge building expansion joints; cut and space edges of sheathing boards to match spacing of structural support elements.

E. Space fasteners maximum 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of sheathing boards and as required in indicated fire-resistance-rated designs.
   1. Apply fasteners so heads are seated flush to board product air barrier membrane surface without breaking or punching through the surface.
      a. Treat all fasteners with specified fluid-applied flashing used for sealing joints.
      b. Misplaced fasteners shall be left in place and treated. If fasteners must be removed, patch and treat resulting hole per system manufacturer’s written instructions.
   2. Securely attach sheathing boards to substrate by fastening as indicated, complying with the following:
      a. Table 2304.9.1, "Fastening Schedule," in the IBC.
      b. ICC-ES evaluation report for fastener.
   3. Use corrosion resistant sheet metal screw fasteners. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections.

F. Coordinate wall sheathing boards installation with flashing and air barrier accessory material installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

3.4 INSTALLATION OF SITE FLUID-APPLIED AIR BARRIER FLASHING

A. General: Apply site fluid-applied AB at joints, fasteners, penetrations, openings, and material transitions to achieve a continuous air barrier according to air barrier manufacturer's written instructions. Apply site fluid-applied AB within manufacturer's recommended application temperature ranges.

B. Apply self-adhered flashing material in full contact with substrate to produce a continuous seal according to air barrier manufacturers written instructions.
   1. Vapor-Permeable Air barrier: Total wet film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 16 mils wet film thickness, applied in one or more equal coats by roller, spray, trowel, or knife.

C. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

D. Do not cover air barrier until it has been inspected and approved by the Authority Having Jurisdiction for compliance with the applicable IBC and IECC. Components and systems subject to inspections include, but are not necessarily limited to, the following:
   1. Inspections at framing and rough-in shall be made before application of exterior and interior finishes and shall verify compliance with the code as to air leakage controls.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.5 INSTALLATION OF AIR BARRIER ACCESSORY MATERIALS

A. General: Install accessory materials according to air barrier manufacturer's written instructions and AAMA 714. Install AB to adjacent components of building air barrier system, including, but not limited to, roofing system air barrier, exterior fenestration systems, door framing, and other openings.

B. Apply primer according to manufacturer's written installation instructions.

C. Seal punctures, voids, and seams. Patch with fluid-applied flashing extending 6 inches beyond repaired areas.

D. Seal wall penetrations according to manufacturer's written installation instructions and recommendations.

E. Connect and seal exterior wall air barrier continuously to subsequently-installed roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

F. Rough Openings: Apply bead of fluid-applied flashing to inside corners first, followed by application to jambs, header, sill, and adjacent sheathing.

G. Flashings: Seal top of through-wall flashings to air barrier with fluid-applied flashing.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.
   1. Inspections: ABs, accessories, and installation are subject to inspection for compliance with requirements and photograph documentation of conditions to be concealed by subsequent Work.

B. Tests: As determined by Owner's testing agency from among the following tests:
   1. Qualitative Air-Leakage Testing: Test air barrier assemblies for air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization or ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
   2. Quantitative Air-Leakage Testing: Test air barrier assemblies for air leakage according to ASTM E 783.
   3. Testing: See applicable specifications sections for additional testing and inspection requirements.

C. Air- and water-resistive sheathing board will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTING

A. Clean spills, stains, and overspray resulting application using cleaning agents recommended by manufacturers of affected construction. Remove masking materials.

B. Protect air barrier from damage from subsequent work. Protect materials from exposure to UV light for period in excess of that acceptable to air barrier manufacturer; replace overexposed materials and retest.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concealed mastic dampproofing in masonry walls. Refer to schedule at end of section.

B. Related Requirements:
1. Section 04 20 00 - Masonry Units.
2. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System
3. Section 07 13 26 - Self-adhering Sheet Waterproofing.
4. Section 07 14 00 - Fluid-applied Waterproofing.
5. Section 07 27 26 - Fluid-Applied Membrane Air Barriers
6. Section 07 65 00 - Flexible Flashing

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Indicate properties of products, performance characteristics, proposed use, and certifications that product meets or exceeds standards.

C. Manufacturer's Instructions: Including application instructions, precautions, material safety, and methods of attachment/embedment into substrate data sheets.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Waterproofing Manual, and manufacturer's instructions, whichever are more stringent.

B. For interior and concealed in all applications, provide product certified by manufacturer to be substantially odor-free within 24 hours of application.

1.4 QUALIFICATIONS

A. Applicator Qualifications: Company experienced in application of dampproofing with 3-years experience on similar sized projects.

1.5 FIELD SAMPLES

A. Provide 4 x 6 foot field sample of mastic dampproofing under provisions of SECTION 01 45 00 - QUALITY CONTROL illustrating application techniques and material thickness.

B. Sample may be incorporated as part of work if approved in writing by Architect.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING PROTECTION.

B. Do not allow products to become frozen.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient and surface temperature above 40°F. for 24 hours before application and continuously until mastic dampproofing has cured.

B. Do not allow dampproofed surfaces to be exposed to prolonged sunlight.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate installation in accordance with SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION. Do not begin work until substrate preparation is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mastic: ASTM D 1227, Type II, Class 1, semi-mastic asphaltic emulsion reinforced with non-asbestos fibers. Product/manufacturer; one of the following:
920AF Fibered Emulsion Mastic; Karnak
Sealmastic; W.R. Meadows, Inc.
Sikalastic 315 (formerly MasterSeal 615); Sika.

B. Substitutions: Submit in accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 ACCESSORIES

A. Mastic Dampproofing:
1. Emulsion Based Dampproofing: Non-asbestos fiber reinforced emulsion asphaltic compound, brush or spray consistency, meeting requirements of ASTM D 1227 or FS-4-1781.
2. Reinforcing Mesh; Treated glass fabric, woven design, 20 x 10 mesh.
3. Plastic Cement: Type recommended by manufacturer and compatible with dampproofing product, for trowel consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

B. Do not apply when surface of ambient temperature is below 40°F., during inclement weather, or if surface is damp, dirty, or dusty.

C. Verify surfaces are solid and free of cracks, pits, rough or sharp projections.

D. Verify items which penetrate surface to receive dampproofing are securely anchored.

3.2 PREPARATION

A. Remove rough or sharp projections, loose particles, and foreign matter detrimental to adhesion and application of dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's written instructions.

C. Apply two coats of plastic cement and one layer of reinforcing mesh (between plastic cement coats) to seal penetrations, small cracks, and at other areas as recommended by manufacturer.

D. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at control joints.

3.3 INSTALLATION

A. Mastic Dampproofing: For application over concealed masonry and concrete surfaces within walls.
1. Clean surfaces of excess mortar and loose dirt and apply the mastic in two coats by brush or spray. Allow the first coat to dry tacky before applying the second coat.

2. Coverage shall be approximately 35 sq.ft. per gallon per coat. Fill in crevices and grooves and around projecting anchors and joint reinforcement. Make sure that coating is continuous and free from breaks and pinholes.
3. At glass-mat gypsum sheathing, apply dampproofing prior to installation of masonry anchors.

3.4 FIELD QUALITY CONTROL

A. Tests: Periodically (not less than once per 100 sq.ft. of surface area) check application thickness to verify compliance with specified thickness. Immediately re-apply if found to be deficient.

3.5 PROTECTION

A. Protect finished installation under provisions of SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

B. Protect adjacent surfaces not to receive dampproofing against "overspray" or "over brush".

C. Protect dampproofing against damage during backfilling with adhered protection course, neatly fitted around projections and penetrations. Do not apply until dampproofing has thoroughly cured.

D. Protect flashing until placement within wall is complete. Do not allow wind to displace or damage flashing.

3.6 CLEANING

A. Perform final cleaning under provisions of SECTION 01 74 13 - PROGRESS CLEANING.

3.7 DAMPPROOFING SCHEDULE

A. Dampproof as follows with mastic:
1. Over the exterior surfaces of the inside wythe of masonry and concrete backup in below-grade exterior cavity walls to provide an unbroken dampproofing barrier.
2. Over the inside wythe of masonry and concrete backup in non-conditioned buildings or dumpster walls.
3. Elsewhere where indicated.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vertical sheet membrane waterproofing.
2. Horizontal membrane applied at void forms or prepared subbase prior to placement of concrete slabs.

B. Related Sections:
1. Section 03 30 00 - Cast-in-Place Concrete
2. Section 32 05 19 - Geotextiles for Exterior Improvements.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include installation instructions, and general recommendations from waterproofing materials manufacturer.

C. Manufacturer’s field quality-control reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Firm with not less than 5 years of successful experience in installation of waterproofing sheets similar to requirements for this project.

1.4 PROJECT CONDITIONS

A. Substrate: Proceed with work only after substrate construction, openings, and penetrating work have been completed.

B. Weather: Proceed with waterproofing only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.5 WARRANTY

A. Provide written 5-year warranty, signed by Contractor, installer, and manufacturer of primary waterproofing material agreeing to replace or repair defective materials and workmanship. Warranty includes responsibility for removal and replacement of other work which conceals sheet membrane waterproofing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Membrane Waterproofing
1. Sheet Membrane: Self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting, formed into uniform flexible sheets of not less than 56 mils thick. Product/manufacturer; one of the following:
Bituthene; Grace Construction Products
Mel-Rol; W.R. Meadows, Inc.
Polyguard No. 650; Polyguard Products, Inc.
2. Drainage Mat: Reference SECTION 32 05 19 - GEOTEXTILES FOR EXTERIOR IMPROVEMENTS.
3. Protection Board: Organic fiberboard, treated for resistance to fungus and insects, asphalt impregnated and asphalt coated on both faces; ½" thickness.

B. Pre-Applied Horizontal Sheet Membrane Waterproofing

1. Pre-Applied Sheet Membrane: Integrally bonded HDPE sheet waterproofing membrane for horizontal under-slab applications. Provide “300 R Plus” as manufactured by GCP (Grace Construction Products) or approved equivalent. 0.046” (1.2mm) nominal thickness composite sheet consisting of 0.030” (0.8mm) of high-density polyethylene film, a pressure-sensitive adhesive and a trafficable weather resistant coating. Membrane shall form an integral, adhesive and permanent bond to poured concrete.
   a. Physical Properties:
      1) Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D1970.
      2) Peel Adhesion to Concrete: 5 lbf/in. minimum; ASTM D903, modified.
      3) Lap Adhesion: 5 lbf/in. minimum; ASTM D1876, modified.
      4) Hydrostatic-Head Resistance: 230 ft.; ASTM D5385, modified.
      5) Puncture Resistance: 200 lbf minimum; ASTM E154.
      6) Water Vapor Permeance: 0.1 perm (6 ng/Pa x s x sq. m) maximum; ASTM E96, Water Method.
      7) Ultimate Elongation: 335 percent minimum; ASTM D412, modified.
2. Seam Tape: Preprufe Tape HC.
3. Construction Joint Tape: Preprufe CJ Tape HC.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which waterproofing work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Comply with manufacturer's instructions for handling and installation of sheet membrane waterproofing materials.
   2. Coordinate installation of waterproofing materials and associated work to provide complete system complying with recommendations of manufacturer. Schedule installation to minimize period of exposure of sheet waterproofing materials.

B. Sheet Membrane Waterproofing:
   1. Extend waterproofing sheet to provide complete membrane over areas to be waterproofed. Seal to projections through membrane and seal seams.
   2. Install protection board over completed membrane with close butt joints and cut to fit around projections.
   3. Install drainage mat over protection board. Reference SECTION 32 05 19 - GEOTEXTILES FOR EXTERIOR IMPROVEMENTS.

C. Pre-Applied Horizontal Sheet Membrane Waterproofing:
   1. Strictly comply with installation instructions in manufacturer’s published literature, including but not limited to, the following:
      a. Place the membrane HDPE film side to the substrate with the green zip strip facing towards the concrete pour. End laps should be staggered to avoid a build-up of layers.
      b. Leave the green and blue (backside) zip strips in position until the overlap procedure is completed, and the lap is to be made.
      c. Accurately position succeeding sheets to overlap the previous sheet 3 in. along the marked selvedge with a blue guideline. The blue zip strip on the underside of the succeeding membrane shall be positioned on top of the green zip strip on the top of the previous sheet. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap.
      d. Peel back and remove both the green and blue zip strips in the overlap area to achieve an adhesive-to-adhesive bond, lining up leading edge of the top sheet with the blue guideline.
      e. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller.
      f. Overlap all roll ends and cut edges by a minimum 3 in. and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams and stagger and tape end laps to ensure watertight installation.
      g. Allow to dry and apply manufacturer’s seam tape centered over the lap edges and roll firmly. Apply additional manufacturer’s seam tape a minimum of 2 in. beyond all edges of membrane that are not sealed by the selvedge.
      h. Immediately remove plain/tinted/printed plastic release liner from the PREPRUFE® Tape.

i. Construction joint optional detailing:
   1) Center manufacturer's construction joint tape at all concrete construction joints and adhere the manufacturer's construction joint tape to the top of pre-applied waterproofing membrane.
   2) Immediately remove tinted plastic release liner from the manufacturer's construction joint tape.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

B. Waterproofing will be considered defective if it does not pass inspections.

3.4 PROTECTION

A. Provide for protection of completed membrane during installation of other materials or processes over membrane and throughout remainder of construction period.

B. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's recommendations.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 14 00

FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fluid applied elastomeric waterproofing:
   1. Horizontal waterproofing membrane over concrete floor slabs.
   2. Vertical waterproofing below-grade.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete.
   2. Section 32 05 19 - Geotextiles for Exterior Improvements.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include membrane thickness, accessories, and method of application.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: This work shall be performed by an experienced applicator who has successfully applied the materials and used the methods specified under similar conditions over a period of at least five years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in the original, sealed containers or unopened packages clearly labeled with the manufacturer's name and the contents.

B. Store materials in a heated and ventilated area located away from all sources of sparks and open flame. Containers of liquid material shall not be left open at any time in the storage area.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Elastomeric Waterproofing: Provide a one-component, moisture-curing, bitumen-modified polyurethane elastomeric waterproofing membrane, containing no coal tar extenders. Provide formulation appropriate for chosen horizontal or vertical installation with associated trowel, squeegee, roller or spray application. Product/manufacturer; one of the following:
   MasterSeal HLM 5000; Master Builders Solutions, a brand of MBCC Group.
   MiraSEAL; Carlisle Coatings & Waterproofing Incorporated (CCW)

B. Flashing Membrane: Provide 1/16" thick neoprene synthetic rubber sheet.

C. Adhesive: Provide neoprene adhesive manufactured expressly for use with the synthetic rubber flashing membrane.

D. Drainage Mat: Reference SECTION 32 05 19 - GEOTEXTILES FOR EXTERIOR IMPROVEMENTS.

E. Protection Board: Provide a semi-rigid, asphalt saturated board ⅛" thick. Product/manufacturer: Type PC-2 Protection Course; W.R. Meadows.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove loose dirt and debris and clean off oil, grease, paint and other foreign contaminants to leave the concrete surface clean and dry. Immediately prior to and during application, remove dirt and dust from the

surface with compressed air or a soft broom. Mask with paper and tape the surfaces not designated to receive waterproofing to protect them from accidental application of the waterproofing material.

3.2 INSTALLATION

A. Applying Waterproofing:
1. Select the grade of product that best meets the individual job requirements.
2. Mix the waterproofing compound thoroughly in conformance with the manufacturer's printed instructions.
3. Horizontal Application: Apply product over horizontal surface in one coat using a roller, trowel, or squeegee as required to obtain thickness required. Pour the mixed compound onto the concrete floor and spread out with trowel and squeegee to a thickness of not less than 1/16". Coverage shall be not less than 4 gallons per square.
4. Vertical Application: Apply one coat using a roller, trowel, or squeegee as required to obtain thickness required. Wait for material to film form and become stable between each coat.
5. Install flashing membrane along perimeter walls. Install with adhesive applied to the concrete surface and to the back of the membrane. Press firmly into place without stretching and work out all bubbles, wrinkles and fishmouths. At walls in horizontal application, turn membrane up approximately 3" above the waterproofed surface to form a dam. Lap joints 3" and bond with adhesive.
6. Over flashing membrane, apply a thin coat of neoprene adhesive and allow to dry until tacky before covering with the waterproofing compound. On metal pipes and conduits projecting through the concrete, apply a second coat of waterproofing compound after the first coat has cured. Extend the waterproofing into the floor drain flashing rings.
7. For at least 24 hours after completion of the waterproofing, keep the area clear of all traffic. After testing for leaks, cover the waterproofing with protection board laid with close butt joints and cut to fit around projections and at offsets.

3.3 FIELD QUALITY CONTROL

A. Testing: Floor areas protected with elastomeric waterproofing shall be flood tested for leaks prior to installing the protection board. Plug the floor drains and flood the areas with water to a depth of 2" or more. Allow the water to stand for 24 hours before draining off. Repair all leaks.

END OF SECTION

SECTION 07 18 13

PEDESTRIAN TRAFFIC COATING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior pedestrian traffic coating system.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include a printed sample of the joint guarantee to be furnished with the accepted coating system.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of traffic coatings required for this Project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
1. Manufacturer's brand name.
2. Type of material.
3. Directions for storage.
4. Date of manufacture and shelf life.
5. Lot or batch number.
6. Mixing and application instructions.
7. Color.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40°F., when relative humidity exceeds 85 percent, or when temperatures are less than 5°F. above dew point.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which traffic coating manufacturer agrees to repair or replace traffic coatings that deteriorate within five years from date of substantial completion.
1. Deterioration of traffic coatings includes the following:
a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.
d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Traffic Coatings: Complying with ASTM C 957.

B. Material Compatibility: Provide primers, base, intermediate, and topcoats; and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.2 PEDESTRIAN TRAFFIC COATING

A. Product/manufacturer: Subject to compliance with requirements, provide one of the following:
Sikalastic Pedestrian Traffic 1500 (M200/TC225 HT); Sika (Formerly MasterSeal Traffic 1500).
Pecora Deck 802/804/806 System; Pecora Corporation (Carlisle CCW System)
Peda-Gard; Neogard, Division of Hempel

B. Primer: Manufacturer's standard factory-formulated urethane primer recommended for substrate and conditions indicated.

C. Preparatory and Base Coats: Single- or multi-component, aromatic liquid urethane elastomer.

D. Topcoat: Single- or multi-component, aliphatic liquid urethane elastomer. Color shall be Gray.

E. Aggregate: Uniformly graded, washed silica sand of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer. Spreading rate as recommended by manufacturer for substrate and service conditions indicated, but not less than 8 to 10 lb./100 sq. ft.

2.3 MISCELLANEOUS MATERIALS

A. Joint Sealants: Low modulus unmodified polyurethane based.

B. Adhesive: Contact adhesive recommended in writing by traffic coating manufacturer.

C. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic coating manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements and for other conditions affecting performance of traffic coatings.

B. Begin coating application only after minimum concrete curing and drying period recommended by traffic coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.

C. Verify that substrates are visibly dry and free of moisture. Test for moisture vapor transmission by plastic sheet method according to ASTM D 4263.

D. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Clean and prepare substrates according to ASTM C 1127 and manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.

B. Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.

C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform profile according to ASTM D 4259. Do not acid etch.
1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
2. Remove concrete fins, ridges, and other projections.
3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
4. Remove remaining loose material to provide a clean, sound surface.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at drains and sleeves according manufacturer's written recommendations.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks.

3.5 TRAFFIC COATING APPLICATION

A. Apply traffic coating material according to ASTM C 1127 and manufacturer's written recommendations.

B. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated, and omit aggregate on vertical surfaces.

C. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.

3.6 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 19 00

WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Clear water repellent coating applied to exterior vertical and sloping concrete and masonry (brick and cast stone) surfaces.

B. Related Sections:
1. Section 03 30 00 - Cast-in-place Concrete: cleaning of concrete surfaces.
2. Section 04 20 00 - Masonry Units: cleaning of masonry surfaces.
3. Section 09 91 00 - Painting: painting of exterior concrete masonry units.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Include manufacturer's installation instructions.

B. Samples: 12" x 24" sample of substrate with half of sample having been treated with coating and the other half bare.

C. Manufacturer's Instructions: Installation instructions, including application rates, methods and techniques.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Work shall be performed by an experienced applicator who has not less than five years experience and has successfully applied this material under similar conditions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in the original, sealed containers clearly labeled with the manufacturer's name and the contents. Store material in a well-ventilated area.

1.5 FIELD SAMPLE

A. Apply coating to approximately a 100 sq. ft. area of substrate material for Architect's approval.

B. Verify that substrate has received a sufficient amount of coating to perform as intended and that product is not staining or discoloring surface.

C. When approved, field sample may remain as part of the work.

1.6 PROJECT CONDITIONS

A. Do not apply coating when ambient or substrate temperatures are lower than 40°F. or higher than 100°F.

B. Do not apply during inclement weather or when forecasted conditions will not permit work in accordance with manufacturer's printed instructions.

C. Do not apply during windy conditions that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.

D. Provide mechanical ventilation during and after application to dissipate fumes if natural ventilation is insufficient.

1.7 WARRANTY

A. Warranty: Submit a written warranty, executed by the applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within 5 years from date of substantial completion.

1.8 EXTRA MATERIALS

A. Furnish under provisions of SECTION 01 78 40 - SPARE PARTS, OVERAGES, AND MAINTENANCE MATERIALS.

B. Provide two gallons of coating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide a colorless water and stain repellent coating for concrete and masonry. Coating shall be clear, liquid, penetrating, solvent based, non-yellowing, non-staining, breathable solution of a silane/siloxane blend, having minimum solids of 5% as determined by ASTM D 2369 testing, and meeting requirement of FF-SS-110C. Product/manufacturer; one of the following:
Prime-A-Pell 200; Chemprobe Coating Systems, A Division of Tnemec Co., Inc.
Sure Klean Siloxane PD Prosoco
Chemstop WB; Euclid ChemicalCo.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

B. Verify that surfaces are clean, dry, sound, properly covered, dust free, free of efflorescence, oil or other matter detrimental to coating application.

C. Verify that joint sealant work is complete and sealant has properly cured.

D. Verify that cracks in concrete larger than 1/64" in width have been filled with patching compound acceptable to coating manufacturer.

3.2 PREPARATION

A. Examine surfaces to be treated for loose dirt and debris, stains, chemical films, oil, grease, paint and other foreign contaminants. Surfaces shall be clean and dry prior to application. Immediately prior to and during application, remove any dust and dirt from surfaces.

B. Allow surfaces to dry sufficiently after washing in accordance with manufacturer's directions.

C. Protect adjacent surfaces from overspray or drift.

D. Protect landscaping, adjacent property, and vehicles.

E. Comply with manufacturer's written instructions.

3.3 INSTALLATION

A. Apply using skilled workmen in accordance with manufacturer's printed instructions and recommendations.

B. Apply the coating to dry surfaces using a standard metal tank sprayer or painting apparatus such that the treatment totally wets the surface. Apply evenly, being careful to avoid excessive run down. Avoid misting of the spray as the treatment is applied. Protect shrubs and painted surfaces during application. Allow coating to cure.

C. Do not dilute or alter material as packaged.

3.4 CLEANING

A. Take care to avoid spraying coating on adjacent materials. Any such soiling shall be carefully and completely cleaned using a suitable solvent.

B. After application on glazed brick and mortar, wipe down brick only to remove any extra coating residue retained on the brick.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Thermal, acoustical, and fire safing building insulations.

B. Related Sections:
1. Section 04 20 00 - Masonry Units.
2. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System
3. Section 07 21 19 - Foamed-in-Place Insulation
4. Section 07 27 26 - Fluid-Applied Membrane Air Barriers
5. Section 07 41 20 - Prefinished Metal Roof Panels; roof insulation
6. Section 07 52 00 - Modified Bituminous Membrane Roofing; roof insulation
7. Section 07 65 00 - Flexible Flashing
8. Section 07 84 00 - Firestopping.

1.2 SUBMITTALS

A. General: Submit following items under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Including performance specifications, composition and applicable standards.

C. Samples: Submit 12" x 12" size samples of each type insulation proposed for use.

D. Manufacturer's Instructions: Written installation instructions, including attachment recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: (See Articles below for specific products)
CertainTeed Architectural
Dow Chemical Company
Johns Manville, A Berkshire Hathaway Co., Denver, CO
Knauf Insulation
Owens Corning, Toledo, OH
Rockwool
Thermafiber, Inc. (Owens Corning)
U.S. Gypsum Co.

2.2 BATT THERMAL INSULATION

A. Glass fiber composition, unfaced, minimum one lb./c.f. density, meeting following standards:
1. ASTM E 84: FHC 25/50 maximum.
2. ASTM C 518: R value of 3.2 per inch of thickness.
3. ASTM C 665: Type I and Type III, Class A.

B. Following products are acceptable:
1. Unfaced Thermal Batts by Owens Corning Fiberglas Corp.
2. Unfaced Building Insulation by CertainTeed Architectural
3. Unfaced Building Insulation by Johns Manville Corp.
4. Unfaced EcoBatt Insulation by Knauf Insulation

2.3 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.

2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Following products are acceptable:
1. TempControl Mineral Wool Batts; Johns Manville Corp.
2. Thermafiber Ultrabatt Mineral Wool Insulation; Owens Corning
3. Comfortbatt; Rockwool

2.4 SEMI-RIGID INSULATION

A. Continuous Insulation Basis of Design: Provide Thermafiber RainBarrier Insulation as manufactured by Thermafiber, Inc. (an Owens Corning company), One Owens Corning Parkway, Toledo, OH 43569 (phone: 888-834-2371; web: www.owenscorning.com.)
1. Acceptable Products/Manufacturers:
JM CladStone 60 Water & Fire Block; Johns Manville
Thermafiber RainBarrier; Owens Corning
Cavityrock; Rockwool
2. Description: Non-combustible, semi-rigid mineral wool insulation board that is water repellent and meets ASTM C 612, IA and IB; passing ASTM E136 for combustion characteristics.
3. Thickness: As noted on contract drawings.
4. Paint flat black behind joints at open joint panel assemblies.
5. Type:
a. R-value of min. 4.3 per inch.
b. Facing: Unfaced.
c. Density: 6.0 pcf.
d. Surface Burning Characteristics: Unfaced-Flame Spread 0 and Smoke Developed 0
e. Moisture Resistance: Absorbs less than 0.03% by volume, ASTM C 1104.
f. Non-corrosive, ASTM C 665.
g. Recycled Content for Standard Mineral Wool Products.……..…70%

2.5 BATT ACOUSTICAL INSULATION

A. Unfaced glass fiber composition, 3½" thick, minimum one lb./c.f. density, meeting following standards:
1. ASTM E 84: FHC 25/50 maximum.
2. ASTM C 518: R value of 3.2 per inch of thickness.
3. ASTM C 665: Type I, Class A.

B. Following products are acceptable
1. Sound Control Batts by CertainTeed Architectural
2. EcoTouch Sonobatts by Owens Corning Insulating Systems, LLC
3. Unfaced Building Insulation by Johns Manville Corp.
4. EcoBatt Insulation by Knauf Insulation

2.6 FIRE SAFING INSULATION

A. Mineral fiber composition, 4" thick, 4.0 pcf density, meeting following standards
1. ASTM E 84: FHC 15/10 maximum.
2. ASTM C 665: Type I, Class A
3. ASTM E 119: Testing Procedures.
4. FS HH-I-558B: Class 1 and 2.

B. Following products are acceptable
1. Thermafiber Safing Insulation by Owens Corning.
2. Mineral Wool Safing Insulation by Johns Manville.

2.7 ACCESSORIES

A. Joint Tape: Pressure sensitive type, recommended by insulation manufacturer.

B. Insulation Adhesive: Type recommended by insulation manufacturer.

C. Stick Clips

1. Galvanized sheet metal with impaling pins and retainer washers.
2. Size and type to suit application and insulation thickness.
3. Approved by manufacturer of insulation for intended use.

D. Stick Clip Adhesive
1. High strength, resilient adhesive, having drying time of 0 to 30 minutes (rapid initial set), and 24 hours final set.
2. Compatible with insulation adhesive, insulation and substrate.
3. Non-corrosive to galvanized steel.

E. Supportive Wire Mesh: Hexagonal design, woven mesh "chicken wire" style.

F. Tie wire: Minimum 18 ga. annealed wire.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive insulation for conditions that will adversely affect the execution and quality of the work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Fit insulation tight within stud spaces, above soffits, behind fascias, and tight to and behind mechanical and electric services within plane of insulation, leaving no gaps or voids. Butt insulation tightly. Cut and fit tightly around items penetrating insulation. Stagger and butt joints, or cavity of a cavity wall system.

B. Install in conformance with the manufacturer's recommendations. Cut material to fit closely around obstructions and projections.
1. Walls: Secure insulation by mechanical means to hold it in place without sagging or slumping. Install insulation with edges and joints butted tight to leave no gaps.
2. Soffits: Insulation shall be laid between wire hangers on back of cement plaster and over cross runners. Sides and ends of adjacent batts shall be tightly butted together.
3. Acoustical Insulation:
a. Install acoustical insulation between the studs in those gypsum drywall partitions so detailed and noted on the drawings. Staple blankets to the gypsum board or otherwise fasten in place as recommended by the manufacturer of the blankets. Fill all voids.
b. Where indicated at suspended gypsum board ceilings, lay sound attenuation blankets between wire hangers on back of gypsum board and over cross runners. Do not install on top of or within 3" of light fixtures.

C. Applying Semi-Rigid Insulation: Install board insulation between the wythes in exterior masonry walls.
1. In masonry walls place boards over the fluid-applied membrane air barrier on the face of the backup masonry before the face brick wythe is laid.
2. Securely fasten the board to the backup with mastic and suitable mechanical anchors to hold it firmly in place.
3. In framed construction, apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
4. Cut the material to fit snugly around obstructions and projections. Joints shall be tight.
5. Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

D. Safing Insulation: Compress and install insulation on wire hangers or clips in spaces between floor slabs and curtain walls. Also, in openings in floor slabs to seal around telephone cables, piping, ducts and other utilities per SECTION 07 84 00 - FIRESTOPPING.

3.3 SCHEDULES

A. Provide R values for thermal insulation as indicated on the drawings.

B. Provide acoustical insulation in thickness and locations as follows:

1. Walls: 3½" (or as shown on drawings)
2. Above Ceilings: 3½" (or as shown on drawings)

END OF SECTION

SECTION 07 26 00

VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

B. Related Sections:
1. Section 03 11 00 - Concrete Forming and Accessories: Masonite topping sheet.
2. Section 03 30 00 - Cast-in-Place Concrete.
3. Section 07 62 00 - Sheet Metal Flashing and Trim: Vapor retarder at roof expansion joints.
4. Section 31 31 00 - Soil Treatment: Temporary polyethylene sheeting over treated soil.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Provide product data for each type of product.
2. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
3. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor Retarder: Product/manufacturer; one of the following:
Ecoshield-E; Epro Services
Stego Wrap (15 mil) Vapor Retarder; Stego Industries, LLC
Perminator (15 mil); W.R. Meadows
1. Vapor Retarder membrane shall have the following qualities:
a. Permeance of less than 0.01 Perms [grains/(ft2*hr*inHg)] as tested after mandatory conditioning tests ASTM E 154 (sections 8, 11, 12, 13) per ASTM F 1249 or ASTM E 96.
b. ASTM E 1745 Class A.
c. Minimum thickness 15 mils.
2. Accessories:
a. Seam Tape: High-density polyethylene tape with pressure sensitive adhesive. Minimum width 3.75 inches.
b. Pipe Boots (Penetrations of Vapor Retarder): Construct pipe boots from vapor retarder material and pressure sensitive tape per manufacturer's instructions.
c. Perimeter/edge seal: Provide the following as manufactured by Stego Industries LLC, (887) 464-7834 www.stegoindustries.com.
1) Stego Crete Claw
2) Stego Term Bar.
3) StegoTack Double-Sided Tape.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove soil treatment protective vapor retarder before placement of permanent vapor retarder.

B. Ensure that subsoil is approved by Architect and/or geotechnical engineer.

3.2 INSTALLATION

A. Install vapor retarder in accordance with manufacturer's instructions and ASTM E 1643.

B. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete pour.

C. Extend vapor retarder to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor retarder. At the point of termination, seal vapor retarder to the slab itself using perimeter/edge seal, such as Stego Crete Claw or termination bar and tape per manufacturer's instructions.
   1. Continue vapor retarder down the interior face of the perimeter grade beam, across the bottom of the grade beam, and up the outside face to within 6” of finish grade.

D. Overlap joints a minimum of 6" and seal with manufacturer’s seam tape.

E. Seal all penetrations (including pipes) with manufacturer’s pipe boot.

F. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor retarder.

G. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6" and taping all four sides with tape.

END OF SECTION

SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vapor-permeable, fluid-applied air barriers, which also function as water-resistive barriers.

B. Related Requirements:
1. Section 01 45 00 - Quality Control: for general mockup requirements.
2. Section 01 45 23 - Testing and Inspection Services: for coordination with testing agency.
3. Section 04 20 00 - Masonry Units; concrete unit masonry treatment.
4. Section 06 16 56 - Air and Water-Resistive Sheathing Board System: for vapor-permeable air- and water-resistive wall sheathing and associated site-fluid-applied air barrier flashing.
5. Section 09 21 16 - Gypsum Board Assemblies: for glass-mat gypsum wall sheathing and wall sheathing joint and penetration treatments.

1.2 DEFINITIONS

A. Air-Barrier Material (AB): A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

D. Water-Resistive Barrier (WRB): Water-shedding barrier made of material that is moisture-resistant, and installed to shed water, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.
4. Consult air barrier manufacturer for additional installation guidelines and illustrations to assist with meeting shop drawing requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
1. Certification shall include statement that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use.
2. Certification shall include statement that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
1. Build integrated mockups of exterior wall assembly 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
   a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
   b. Include junction with roofing membrane**,** building corner condition, and foundation wall intersection.
   c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
3. Water Penetration Testing: Mockups will be tested for water penetration according to ASTM E 1105.
4. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate according to ASTM D 4541 (modified).
   a. Use a type II pull tester, except that the membrane shall be cut through to separate the material attached to the disc from the surrounding material.
   b. Perform test after curing period recommended by the material manufacturer.
   c. Record mode of failure and area where the material failed in accordance with ASTM D4541.
   d. The inspection report shall indicate whether the specified adhesion requirement has been met.
5. Compatibility Determinations: Mockups will be inspected for visual signs of decay, chemical attack, or degradation of any kind. Suspect instances shall be reported to the corresponding manufacturer who shall provide a letter that approves moving forward with the project or rejects the use of the product or rejects the method or circumstances of installation with an appropriate explanation of the position taken.
6. Notify Architect seven days in advance of the dates and times when mockups will be tested.
7. Perform the air leakage test and water penetration test of mockups prior to installation of cladding and trim but after installation of all fasteners for cladding and trim, and after installation of other penetrating elements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

C. Deliver materials to Project site in original packages with seals unbroken, labeled with material Manufacturer's name, product, date of manufacture, and directions for storage.

D. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by material manufacturer.

E. Handle materials in accordance with material manufacturer’s recommendations.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

B. Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.

C. Compatibility. Do not allow air barrier materials to come in contact with chemically incompatible materials.

D. Ultra-violet Exposure. Do not expose air barrier materials to sunlight longer than as recommended by the material manufacturer.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which air barrier manufacturer agrees to furnish and install air barrier material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
   1. Manufacturer’s Warranty Period: Five (5) years from Date of Substantial Completion.

B. Installer’s Warranty: Provide installer’s installation warranty, including all accessories and materials of the air barrier assembly, against failures including loss of airtight seal, loss of watertight seal, loss of attachment, loss of adhesion and failure to cure properly.
   1. Installer’s Warranty Period: Two (2) years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
   1. If the materials in this section are adjacent to the materials specified in Section 06 16 56 Air- and Water-Resistive Sheathing Board System, all materials in this section shall be compatible with the materials and products specified in that section and shall be approved by the air- and water-resistive sheathing board system manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 MEDIUM-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. Medium-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 17 to 30 mils (0.4 to 0.8 mm) over smooth, void-free substrates.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Prosoco, Inc.; R-Guard Cat 5 (at medium-build thickness) or a comparable silyl-terminated polyether (STPE) product by one of the following:
      Tremco, Inc.
      3M Industrial Adhesives and Tapes Division.

DuPont Safety & Construction.
GE Construction Sealants; Momentive Performance Materials Inc.
Hohmann & Barnard, Inc.
W.R. Meadows, Inc.

2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
   c. Ultimate Elongation: Minimum 250 percent; ASTM D 412, Die C.
   d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
   e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   f. UV Resistance: Can be exposed to sunlight for 120 days according to manufacturer's written instructions.
   g. Fastener Sealability: No water infiltration when tested in accordance with ASTM D 1970.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Dow Corning Corporation.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      c. Pecora Corporation.
      d. Prosoco, Inc.
      e. Tremco Incorporated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
   3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
   4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
   1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
   2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
   3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
   4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
   1. Transition Strip: Roll firmly to enhance adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
   1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond or thickness, allow adequate drying time between coats.

B. Medium-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.
1. Vapor-Permeable, Medium-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 17 mils, applied in two equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.
a. Second coat shall be back rolled in accordance with manufacturer's written instructions.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

C. Tests: As determined by testing agency from among the following tests:
1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
   2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 41 20

PREFINISHED METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefinished metal roof panels, including related insulation, underlayments, flashing, trim and accessories.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry.
2. Section 07 62 00 - Sheet Metal Flashing and Trim.
3. Section 07 72 13 - Manufactured Roof Curbs and Portals.
4. Section 07 92 00 - Joint Sealants.
5. Section 13 34 19 - Metal Building Systems.

1.2 SYSTEM REQUIREMENTS

A. Performance Requirements
1. Uplift resistance: UL Class 90 wind uplift resistance.
2. Design and install system to accommodate thermal expansion, thermal contraction and building movement.

1.3 SUBMITTALS

A. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Shop Drawings: Drawings shall indicate type of roof panels, gage of metal, finish and shape and size of flashing and accessories.

C. Product Data: Submit manufacturer's technical literature indicating properties of materials, finishes and performance capabilities.

D. Samples
1. Submit 2' x 4' section of roof and soffit panel systems, complete with flashings and attachment devices.
2. Upon selection of colors by Architect, submit 12" x 12" finish samples representing color and finish.
3. Submit 6" x 6" sample of self-adhering sheet underlayment.

E. Color Charts: Submit samples of manufacturer's full range of standard colors. Submit actual color chips, not photo reproductions.

F. Qualification Data
1. Submit installer qualifications verifying years of experience; include list of completed projects having similar scope of work identified by name, location, date, reference name and phone number.
2. Submit letter certifying manufacturer's approval for installation of system.
3. On-site or field manufactured panels are not acceptable, unless approved in writing. Field curving of pre-manufactured panels is acceptable. If on site roll-forming is approved, submit documentation on roll-forming equipment which will be used to roll-form roofing panels on site. Provide copy of UL certificate, including certification report identifying Make and Model No., Serial No. of roll-forming machine, panel specification and expiration date of certificate.

G. Manufacturer's Instructions: Submit written installation instructions indicating method and sequence of installation. Provide for roofing system and self-adhering sheet underlayment.

H. Warranty: Submit signed and dated copies of warranties.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: This work shall be performed by an experienced applicator who has successfully installed the materials under similar conditions over a period of at least 10 years.

B. Cover self-adhering sheet underlayment within 14 days of underlayment installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver preformed metal roof panels and trim items to the project site with no dents, scratches, or abraded areas. Deliver in manufacturer's standard bundles, securely bound and store at the project site raised above slab or ground level on pallets.

1.6 WARRANTY

A. Submit manufacturer's standard 20-year warranty against fading or visible (noticeable) chalking, checking, crazing or peeling of the exterior finish when exposed to natural sunlight for a period of 20 years.

B. Submit manufacturer's 20-year “No-Dollar-Limit” Complete System panel and trim weathertightness warranty.

C. Submit applicator's 2-year weathertightness warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Roof Panels: Basis of Design shall be “Superlok” 16” panel, with 2” panel seam height as manufactured by MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.; Houston TX. Tel: (877)713-6224; Email: info@mbci.com; Web: www.mbci.com. Metal panels shall be zinc coated steel complying with ASTM A 653, and with ASTM A 653 G90 hot-dip coating, 24 gage minimum thickness, with striations, for roof panels. All panels shall have the same spacing. Panels shall be single pieces with no horizontal joints. Provide one of the following:
MBCI; LokSeam
Merchant & Evans, Inc.; Classic Rib 305
Peterson Aluminum Corp.; Snap-Clad

B. Finish: Metal roof panels, and all exposed trim items, shall receive fluorocarbon polymeric coating containing 70% PVDF Hylar 5000 or Kynar 500 finish. Color shall be as selected by Architect from manufacturer’s complete color line.

C. Flashing and all trim items which are contiguous to roof panels shall be of the same metal and finish as roof panels.

D. Panel Clips: Provide panel clip of type specified, at spacing indicated on approved shop drawings.

E. Fasteners: Provide manufacturer's standard zinc coated self-tapping screws meeting UL 90 requirements.

F. Isocyanurate Insulation: Reinforced isocyanurate foam core faced both sides with non-asphaltic glass fibers chemically bonded in the manufacturing process.
1. Compressive Strength: 20 psi
2. Install in not less than 2 layers of 2.5” min. thickness per board to achieve Thermal Resistance (LTTR value) as designated in Building Envelope Assembly Type drawings.

G. Self-adhering Sheet Underlayment (High Temperature): 30 to 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: Stable after testing at 240 degrees F; ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Products: Subject to compliance with requirements, provide one of the following:
Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
Grace Construction Products; a unit of Grace, W. R. & Co.; Ultra.
Henry Company; Blueskin PE200 HT.
Metal-Fab Manufacturing, LLC; MetShield.

H. Slip Sheet: Provide when required by underlayment or roofing manufacturer. Manufacturer's recommended slip sheet (rosin-sized sheathing paper or unsaturated building paper), of type required for application.

I. Mechanical Fasteners and Bearing Plates: Provide U.L. listed (standard) clip designed to allow panels to expand and contract. Steel deck fasteners shall be UL listed and shall be approved by roofing manufacturer for compliance with UL-90 uplift requirements.

J. Sealants and Gaskets: Manufacturer's standard type suitable for use with installation of metal roofing; non-staining; skinning, non-shrinking and non-sagging; ultra-violet and ozone resistant for exterior applications; colors to match exposed metal.

K. Internal and External Corners: Same materials, gage and finish as panels; profile to suit system; brake formed to required angles. Mitered internal corners, back braced with sheet stock, to maintain continuity of profile.

L. Expansion Joints: Same material and where exposed, finish as panels, manufacturer's standard type, of profile to suit system. Exposed fasteners same finish as panels.

M. Trim, Closure Pieces, Cap, Fascias, Infills, Flashings and Accessories: Same material, gage and where exposed, of same finish as metal panels, brake formed to required profiles.

N. Touch-Up Paint: As recommended by manufacturer.

2.2 FABRICATION

A. Comply with dimensions, profile, gages and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.

B. Fabricate components of the system at the factory, ready for field assembly.

C. Fabrication of component profiles on site not permitted.

D. Apply finish coatings prior to roll forming.

E. Fabricate continuous panels only. No field joints allowed.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine supporting members and areas to receive prefinished metal roof panels, flashing and trim items for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General: Install prefinished metal roof panels and related items in strict compliance with manufacturer's recommendations.

B. Install insulation over metal deck per UL-90. End joints shall occur over solid supports. Stagger end joints of insulation in adjacent rows.
   1. Mechanically fasten first layer to the roof deck.
   2. Apply second layer over first layer in broken joint pattern so that each layer breaks joints both ways with the preceding layer.
   3. Apply insulation with long joints continuous and short joints staggered.
   4. Bring insulation panels into moderate contact with each other and cope to fit neatly around projections.
   5. Joints parallel to ribs on steel deck installation shall be located over solid bearing.
   6. Mechanically fasten first layer to the roof deck throughout. Spacing and number of fasteners shall meet current building code requirements and per UL-90. Adhere second layer of insulation to the first layer.
   7. Do not install more insulation at one time than the amount which can be covered with roofing the same day.
   8. At the end of each day's work and after any other work stoppage, apply temporary water cutoffs in accordance with metal roof manufacturer's approval.

C. Self-adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply over insulation at entire roof area, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Do not install underlayment perpendicular to roof slope except at locations specifically required for watertightness.
   1. Cover underlayment within 14 days. If underlayment cannot be covered within that time period, install an additional layer of underlayment as described above immediately prior to roof installation.
   2. Install underlayment in accordance with underlayment manufacturer's written instructions.

D. Metal roofing installation shall be installed so that entire metal roof system meets UL Windstorm Resistance Classification 90 and meets fire-resistance requirements as indicated on the drawings.

E. Continuous full length pans shall be fabricated by factory roll forming in power equipment capable of producing metal roofing pans to the required lengths. End laps are not allowed. Jobsite roll-forming for panel lengths in excess of 60 feet will only be allowed if manufacturer's factory equipment is utilized and the equipment is operated by manufacturer's trained operator.

F. Anchor components parts of the prefinished roof panels securely in place, providing for necessary thermal and structural movement.

G. Install and securely anchor metal flashing, trim and related items to provide a weathertight enclosure.

H. Install trim, closures, caps and accessories as indicated or required for complete weathertight installation.

I. Provide a concealed fasteners installation system with no fasteners exposed on the exterior face of the work.

J. Seal prefinished roof panels as required for weathertightness.

K. Tolerances:
   1. Maximum Offset from True Alignment Between Adjacent Members Butting or in line: 1/16".
   2. Maximum Variation from Plane or Location Indicated on Drawings: 1/8".

3.3 TOUCH-UP AND CLEAN

A. Touch-up:
   1. Defective materials shall be replaced with new materials.
   2. Field touch-up of scratches or defaced finish will be permitted only if approved by Architect.

B. Cleaning: Clean exposed surfaces; leave free of soil and imperfections.

END OF SECTION

SECTION 07 42 13

METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Preformed metal wall panels and soffit panels, including related flashing and trim installed on the building.

B. Related Sections:
1. Section 05 40 00 - Cold Formed Metal Framing.
2. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System.

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Drawings shall indicate type of wall panels, gage of metal, finish, and shape and size of flashing and accessories.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: This work shall be performed by an experienced applicator who has successfully installed the materials under similar conditions over a period of at least 10 years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver preformed metal wall panels and trim items to the project site with no dents, scratches, or abraded areas. Deliver in manufacturer's standard bundles, securely bound, and store at the project site raised above slab or ground level on pallets.

1.5 WARRANTY

A. Submit manufacturer's standard 20-year warranty against fading or visible (noticeable) chalking, checking, crazing or peeling of the exterior finish when exposed to natural sunlight for a period of 20 years.

B. Submit applicator's 2-year weathertightness warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. (MWP-01, MWP-02, MWP-03) Wall Panels and Soffits: Metal wall panels shall be “FW-120-1” as manufactured by MBCI or approved equivalent. Panels shall be 12" wide with concealed anchors and 1 bead. Panels shall be 22 gauge.

B. Perforated Wall Panel: Provide .032 roll-formed products aluminum “Flush” panel with type F perforations (40% open) as manufactured by Peterson Aluminum Corporation or approved equivalent.
1. Sheet Size: Reference drawings.
2. Shape: Formed panel edges per design details.
3. Finish and Color: Color as selected by Architect.
4. Perforations: Round, 0.250 inch diameter holes. Acceptance of shop drawing samples and mockup must be approved before fabrication of panels may begin.
5. Centers (staggered): 3/8”

C. Finish:
1. Buildings: Metal wall and soffit panels and all exposed trim items shall receive fluorocarbon polymeric coating containing 70% Kynar 500 or Hylar 5000 finish with a dry film thickness of 0.7 to 0.8 mil exclusive of the primer. Color as scheduled in “Material Finish Schedule” in drawings.

D. Flashing, gutters, downspouts, and all trim items which are contiguous to wall panels shall be of the same metal and finish as wall panels. Color(s) as selected by Architect.

E. Fasteners: Screws holding anchor clips to the structure shall be stainless steel cadmium plated self-tapping screws into predrilled holes.
   1. Exposed fasteners shall match the finish of the panel system and shall be aluminum or stainless steel with separate washers with hot-bonded neoprene faces; pop rivets are not acceptable.

F. Building Paper: ASTM D 226, No. 30 asphalt saturated organic felt.

G. Sealant:
   1. Concealed Sealant: Non-curing, non-skinning butyl, polyisobutylene or polybutane tape of sufficient thickness to make full contact with both surfaces.
   2. Exposed Sealant: Curing type, manufacturer’s standard. Color shall be as selected by Architect.

2.2 FABRICATION

A. Comply with dimensions, profile, gages, and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine supporting members and areas to receive preformed metal wall panels, flashing, and trim items for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General: Install preformed metal wall panels and related items in strict compliance with manufacturer's recommendations.

B. Full length pans shall be fabricated by roll forming in power equipment capable of producing metal wall pans to the required lengths.

C. Anchor components parts of the preformed wall panels securely in place, providing for necessary thermal and structural movement.

D. Install and securely anchor metal flashing, trim and related items to provide a weathertight enclosure.

E. Provide a concealed fasteners installation system with no fasteners exposed on the exterior face of the work.

F. Seal preformed panels as required for weathertightness.

G. When used in rainscreen, windscreen or fence location, panels must be fastened (stitched) through side joints.

3.3 TOUCH-UP AND CLEAN

A. Touch-up:
   1. Defective materials shall be replaced with new materials.
   2. Field touch-up of scratches or defaced finish will be permitted only if approved by Architect.

B. Cleaning: Clean exposed surfaces; leave free of soil and imperfections.

END OF SECTION

SECTION 07 46 50

ALUMINUM FACED COMPOSITE PANEL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. The extent of panel system work is indicated on the drawings and in these specifications
   2. Panel system requirements include the following components:
      a. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete watertight installation.
      b. Radiused column covers, soffits, sills, border, and filler items indicated as integral components of the panel system or as designed.

B. Related Sections:
   1. Section 05 12 00 - Structural Steel Framing.
   2. Section 05 40 00 - Cold Formed Metal Framing.
   3. Section 06 10 00 - Rough Carpentry; Back up walls.
   4. Section 07 21 00 - Building Insulation
   5. Section 07 62 00 - Sheet Metal Flashing and Trim.
   6. Section 07 92 00 - Joint Sealants.
   7. Section 09 21 13 - Plaster Assemblies.

1.2 SUBMITTALS

A. Submittals shall be in conformance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

B. Samples
   1. Panel Assembly: Two samples of each type of assembly. 12" (304mm) x 12" (304mm) minimum.
   2. Two samples showing joint treatment between radiused vertical panel and horizontal soffit.
   3. Two samples of each color or finish selected, 3" (76mm) x 4" (102mm) minimum.

C. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

D. Affidavit certifying material meets requirements specified.

E. Product Data:
   1. Two copies of manufacturer's literature for panel material.
   2. Sample Warranty.

F. Documents showing product compliance with the local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate evaluation reports and/or test reports supporting the use of the product. Alternate materials must be approved by the Architect prior to the bid date.

1.3 QUALITY ASSURANCE

A. Composite panel manufacturer shall have a minimum of 5 years' experience in the manufacture of this product.

B. Fabricator/Installer shall be acceptable to composite panel manufacturer.

C. Fabricator/Installer shall have a minimum 5 years' experience of metal panel work similar in scope and size to this project.

D. Field measurements should be taken prior to the completion of shop fabrication whenever possible. However; coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of work. Field fabrication may be allowed to ensure proper fit. However, field fabrication shall be kept to an absolute minimum with the majority of the fabrication being done under controlled shop conditions.

E. Shop drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331 and has not exposed fasteners.

F. Maximum deviation from vertical and horizontal alignment of erected panels: ¼" (6mm) in 20' (6m) non-accumulative.

G. Composite panel manufacturer shall have established a Certification Program acceptable to the local Code Authorities.

H. Panel fabricator/installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect finish and edges in accordance with panel manufacturer's recommendations.

B. Store material in accordance with panel manufacturer's recommendations.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: [20] [10] years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELS

A. (ACM-01, ACM-02, ACM-03) Composite Panels: Aluminum composite material. Product/manufacturer; one of the following:
   Alpolic; Mitsubishi Plastics Composites America, Inc.
   Alucobond; 3A Composites, Inc.
   Reynobond; Alcoa Architectural Products

B. Composite Panels:
   1. Panel Thickness: 0.157” (4mm).
   2. Core: Fire retardant

C. Product Test Performance: Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards required by the Architect and/or the local building code.
   1. Wind Load

a. If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory which show compliance to the following minimum standards:
   1) Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 pounds per square foot (psf) and 30 psf on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E 330 to obtain the following results.
   2) Normal to the plane of the wall between supports, deflection of the secured perimeter framing members shall not exceed L/175 or 3/4", whichever is less.
   3) Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.
   4) Maximum anchor deflection shall not exceed 1/16".
   5) At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16".

2. Air/Water System Test
   a. If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory which show compliance to the following minimum standards:
      1) Air Infiltration - When tested in accordance with ASTM E 283, air infiltration at 1.57 psf must not exceed 0.06 cfm/ft² of wall area.
      2) Water Infiltration - Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems not using a construction sealant at the panel joints (i.e. Dry Systems) shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E 331.
3. Bond Integrity
   a. When tested for bond integrity, in accordance with ASTM D 1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values.
      Bond Strength: 214 psi (Vertical Pull)
      Peel Strength: 115 N mm/mm (22.5 in lb/in) As manufactured
      115 N mm/mm (22.5 in lb/in) after 8 hours in water at 200°F
      115 N mm/mm (22.5 in lb/in) after 21 days soaking in water at 70°F
4. Fire Performance
   a. ASTM E 84 - Flame Spread 0, Smoke Developed 0
   b. ASTM E 162 - No surface flaming

D. Finishes
1. Coil coated KYNAR® 500 or HYLAR® 5000 based polyvinylidene fluoride (PVDF) resin in conformance with the following general requirements of AAMA 2605.
   a. Color: As selected by the Architect. Color range shall be equal to Alucobond's/Reynobond's range of standard colors.
   b. Coating Thickness: 1.0 mil (±0.2 mil).
   c. Hardness: ASTM D 3363; F minimum using Eagle Turquoise Pencil.
   d. Impact:
      1) Test method: ASTM D 2794; Gardner Variable Impact Tester with 5/8" mandrel.
      2) Coating shall withstand reverse impact of 1.5"/pounds per mil substrate thickness.
      3) Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
   e. Adhesion:
      1) Test Method: ASTM D 3359.
      2) Coating shall not pick off when subjected to an 11" x 11" x 1/16" grid and taped with #600 Scotch Tape.
   f. Humidity Resistance
      1) Test Method: ASTM D 2247.
      2) No formation of blisters when subjected to condensing water fog at 100% relative humidity and 100°F for 3000 hours.
   g. Salt Spray Resistance:
      1) Test Method: ASTM B 117; Expose coating system to 3000 hours, using 5% NaCl solution.
      2) Corrosion creepage from scribe line: 1/16" max. (1.6mm).
      3) Minimum blister rating of 8 within the test specimen field.
   h. Weather Exposure
      1) Outdoor:

a) Five-year exposure at 45° angle facing south Florida exposure.
b) Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244.
c) Maximum chalk rating of 8 in accordance with ASTM D 4214.
d) No checking, crazing, adhesion loss.

2) Accelerated:
a) ASTM D 822, 5000 hours in Atlas Type Weatherometer; using cycle of 102 minutes light and 18 minutes diminished light and demineralized water.
b) No checking, crazing, adhesion loss or objectionable color change or chalking.

i. Chemical Resistance:
1) ASTM D 1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes.
2) ASTM D 1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours.
3) No loss of adhesion or gloss and no color change.

2.2 PANEL FABRICATION

A. Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

B. Aluminum Face Sheets:
1. Thickness: 0.020" (0.50mm)
a. Alloy: AA3003 Painted material

C. Panel Weight:
1. 0.156" (4mm)

D. Tolerances
1. Panel Bow: Maximum 0.8% of panel dimension in width and length.
2. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
3. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
4. Maximum deviation from panel flatness shall be 1/8" in 5'-0" on panel in any direction for assembled units. (Non-accumulative)

E. System Characteristics: Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards as follows:
1. System must provide a dry seal (no caulk) reveal joint or an aluminum extrusion with integral weatherstripping as detailed on drawings.
2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
3. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.
4. Fabricate panel system to dimension, size, profile, and radius indicated on the drawings based on a design temperature of 70°F.
5. Fabricate panel system so that no restraints can be placed on the panel which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
6. The finish side of the panel shall have a removable plastic film applied prior to fabrication which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

2.3 ACCESSORIES

A. Extrusions, formed members, sheet, and plate shall conform with ASTM B 209 and the recommendations of the manufacturer.

B. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.

C. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements. Color shall be selected by Architect from manufacturer's full color range.

D. Fabricate flashing materials from 0.030" minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.

E. Fasteners (concealed/exposed, non-corrosive/concealed and exposed, non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.

B. Surfaces to receive panels shall be structurally sound as determined by a registered Architect/Engineer.

3.2 INSTALLATION

A. Erect panels plumb, level, and true.

B. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F. to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation.

C. Panels shall be erected in accordance with an approved set of shop drawings.

D. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.

E. Conform to panel fabricator's instructions for installation of concealed fasteners.

F. Do not install component parts which are observed to be defective, including; warped, bowed, dented, abraised, and broken members.

G. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.

H. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

I. Sealant joints shall be masked off prior to installing sealant to ensure a neat uniform joint.

3.3 ADJUSTING AND CLEANING

A. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the Contractor.

B. Repair panels with minor damage.

C. Remove masking as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the Contractor.

D. Any additional protection, after installation, shall be the responsibility of the Contractor.

END OF SECTION

SECTION 07 48 00

RAINSCREEN ATTACHMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a thermally broken, rainscreen attachment system for attachment of exterior cladding including metal wall panels installed over exterior mineral fiber insulation, not to include façade materials on metal building system.

B. Related Sections:
1. Section 01 45 00 - Quality Control: for general mockup requirements.
2. Section 05 40 00 - Cold-formed Metal Framing: for cold-formed steel exterior wall studs and furring.
3. Section 06 16 56 - Air and Water-Resistive Sheathing Board System: for vapor-permeable air- and water-resistive wall sheathing and associated site-fluid-applied air barrier flashing.
4. Section 07 21 00 - Building Insulation: for mineral wool board insulation.
5. Section 07 27 26 - Fluid-Applied Membrane Air Barriers: for vapor-permeable fluid-applied air barriers, which also function as water-resistive barriers.
6. Section 07 42 13 - Metal Wall Panels.
7. Section 07 46 50 - Aluminum Faced Composite Panel System.

1.2 SYSTEM DESCRIPTION

A. System assembly shall include the following components from the substrate out:
1. Substrate: Wall framing assembly and sheathing, concrete masonry unit wall, or concrete wall.
2. Weather Resistant/Air Barrier over substrate.
3. Mineral fiber insulation (mineral wool board insulation).
4. Thermally broken rainscreen attachment system.
5. Exterior cladding.

B. Design Requirements:
1. Manufacturer is responsible for designing system, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
2. Employ registered professional engineer, licensed to practice engineering in jurisdiction where Project is located, to engineer each component of rainscreen attachment system.
3. Structural Design: Exterior-insulated rainscreen wall assembly capable of withstanding effects of load and stresses from dead loads, wind loads, ice loads (if applicable) as indicated on Structural General Notes on Structural Drawings, and normal thermal movement without evidence of permanent defects of assemblies or components.
   a. Thermal Movements: Provide assemblies that allow for thermal movements resulting from the following maximum ambient temperatures by preventing overstressing of components and other detrimental effects:
      1) Temperature Change (range): 120 degrees Fahrenheit, ambient:
4. Support Framing/Attachment System:
   a. Frequency and spacing of brackets as indicated by manufacture in project specific engineering package.

C. Performance Requirements:
1. Structural Performance:
   a. Framing Members:
      1) Test framing components to AAMA TIR- A8-[04] – Section 7.2 to determine structural performance and effective moment of inertia for each perforated component. Minimum Effective Moment of Inertia for Primary Rail: 0.0134 in4.
      2) Localized bending stress for eccentrically loaded framing members must be evaluated with the maximum effective length of resisting element not more than 12 inches.
   b. Fasteners:
      1) Tension shall be taken as sum of direct tension plus tension due to prying for eccentrically loaded connections. Prying may be reduced or eliminated if proven via engineering analysis or testing.
      2) Minimum Safety Factor of 3 for both tension and shear values.
      3) Combined tension and shear shall be evaluated according to an interaction formula. Sum of terms shall not exceed 1.0.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and descriptions of testing performed on system components to indicate meeting or exceeding specified performance.

B. Shop Drawings:
1. Submit connection details to the cladding manufacturer, showing interface of rainscreen attachment system to substrate and panels with adjacent construction, signed and sealed by Professional Engineer, licensed to practice engineering in jurisdiction where Project is located.
2. Show system installation and attachment, including fastener size and spacing.

C. Structural Calculations:
1. Submit rainscreen attachment manufacturer's comprehensive Structural Design analysis signed and sealed by a Professional Engineer, licensed to practice engineering in jurisdiction where Project is located.

D. Samples: Submit following material samples for verification:
1. Primary Girt Z-Channel: Two (2) samples.
2. Horizontal/Vertical Rails: Two (2) 12-inch long samples.

E. Test Reports:
1. Test to the following standards and provide written test reports by a third party:
   a. AAMA TIR-A8-04: Structural Performance of Composite Thermal Barrier Framing Systems – Section 7.2.
2. Comprehensive three-dimensional thermal modeling report indicating framing systems impact on exterior insulation rated R-value.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Minimum 5 years' experience specializing in the manufacturing of façade attachment/support framing similar to those specified.
2. Ability to demonstrate conformance to testing requirements.

B. Installer Qualifications:
1. Minimum of 3 years' documented experience or minimum of 5 completed projects of equivalent scope and quality and recommended by manufacturer to perform work of this Section.
2. Onsite superintendent or foreman overseeing installation on site during entire work of this Section with experience equivalent to installer and in good standing with the manufacturer.

C. Engineer Qualifications: Registered professional engineer experienced in the design of curtain wall systems, anchors, fasteners and licensed to practice engineering in the jurisdiction where Project is located.

D. Pre-Installation Meeting:
1. Discuss sequence and scheduling of work and interface with other trades.
2. Review metal wall framing assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
3. Review and document methods, procedures and manufacturer's installation guidelines and safety procedures for exterior wall assembly.

E. Mock-Ups: Coordinate mock-up materials and requirements with mock-up specified in Division 01 and exterior cladding specifications.

1.5 QUALITY CONTROL

A. Single source responsibility:
1. Furnish engineered rainscreen attachment system components under direct responsibility of single manufacturer.

B. Field Measurements: Verify actual supporting and adjoining construction before fabrication.

C. Record field measurements on project record shop drawings.

D. Established Dimensions: Where field measurements cannot be made without delaying work, guarantee dimensions and proceed with fabrication of rainscreen attachment system corresponding to established dimensions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials and components in manufacturers' original, unopened and undamaged containers or bundles, fully identified. Exercise care to avoid damage during unloading, storing and installation.

B. Store, protect and handle materials and components in accordance with manufacturer recommendations to prevent damage, contamination and deterioration. Keep materials clean, dry, and free of dirt and other foreign matter, and protect from damage due to weather or construction activities.

1.7 SEQUENCING

A. Ordering: Comply with manufacturers' ordering instructions and lead time requirements to avoid construction delays.

B. Coordinate construction to ensure that assemblies fit properly to supporting and adjoining construction; coordinate schedule with construction in progress to avoid delaying work.

1.8 WARRANTY

A. Manufacturer Warranties:
1. Attachment Systems: Ten (10) year Limited Warranty.
a. Covers components of the attachment system, including structural failure of components when all the materials and components are supplied and installed per manufacturer's requirements.
b. Includes labor and material for removal and replacement of defective material.
c. Includes labor to remove and reinstall façade finish panels, finish closures and façade finish accessories necessary to access defective material.

B. Contractor's Warranties: 2-year labor warranty, starting from date of Substantial Completion, to cover repair of materials found to be defective as a result of installation errors.

PART 2 - PRODUCTS

2.1 RAINSCREEN ATTACHMENT/SUPPORT FRAMING SYSTEM - GENERAL

A. Comply with ANSI/ASHRAE 90.1.

B. Coating Material: ASTM A1046, Zinc-Aluminum-Magnesium, minimum thickness ZM40.
1. ASTM A653 Galvanized steel is not acceptable.

C. Steel Sheet:
1. Steel Classification: Structural Steel (SS), Grade 50, 50 ksi Yield.
2. Corrosion protection coating: ASTM A1046, zinc-aluminum-magnesium, minimum thickness ZM40.

D. Spacing: Comply with manufacturer's Professional Engineer's project specific calculations.

2.2 THERMALLY BROKEN Z-FURRING SYSTEM

A. Primary Horizontal Girt: Basis of Design shall be ThermaZee by Knight Wall Systems or approved equivalent.
1. Minimum 0.055-inch thick (16 gauge) cold-formed steel.
2. Depth: As shown on drawings.
3. Z channel, front and back flanges of equal length with attachment holes.
4. Web Perforations: Minimum 50-percent open area of web penetrating the insulation to reduce thermal transmittance and stop accumulation of water.
5. Thermal Isolation:
a. Located between the back flange and substrate.

b. Continuous along the length of the girt for even load distribution and reduction in prying of substrate connection.
c. Hollow, webbed or open with a minimum of 50-percent reduction in cross sectional area to reduce thermal transmittance.
d. Minimum 0.25-inch thickness
e. Thermal conductivity of less than 0.18 Watts per Meter-Kelvin.
f. Designed to prevent the accumulation or damming of liquid water on upper edge.

6. Pre-Punched Attachment Holes: 1.0 inch on center along length of back flange for proper wall anchor installation location relative to the web to reduce prying action and oversized to allow for thermal contraction and expansion of girt.
7. Finish: Mill finish unless seen through panel system, provide black PVDF coating.

B. Secondary Vertical Rail: Basis of Design shall be PanelRail by Knight Wall Systems or approved equivalent.
1. Minimum 0.055-inch thick (16 gauge) cold-formed steel.
2. Square hat channel with stiffening lips.
3. Profile Depth: 0.75 inches.
4. Rail Fastening Face: Manufacturer's recommendation as Engineered.
5. Weep Drains: 0.75 inches diameter at 4 inches on center along flanges to allow for free air flow.
6. Fastening Face Width: As determined by structural analysis.
a. Oversize holes to allow for thermal contraction and expansion of rail.
7. Finish: Mill finish unless seen through panel system, provide black PVDF coating.

C. Fasteners:
1. Sufficient length to provide solid attachment to structure as required by manufacturer.
2. Thermally isolated with a minimum 0.125-inch thick polymer washer.
3. Framed substrate with sheathing: Self-drill hex-washer-head with 1,000 hour salt-spray rated thermoset polyester coating.
a. Embedment depth: 0.625 inches or three full threads minimum, whichever is greater.
b. Minimum ultimate pull-out capacity from 18 gauge steel: 450 pounds.
4. Concrete and concrete masonry units substrate:
a. Embedment depth: 1.25 inches minimum.
b. Minimum ultimate pull-out capacity from substrate material: 450 pounds.
c. 1/4 inch Kwik-Con II+ by Hilti
d. 1/4 inch Tapcon by Buildex
e. 1/4 inch UltraCon by Elco Industries
f. Approved equal.
5. For secondary rail to primary girt connection: Self-drill hex-washer-head stainless steel with 1,000 hour salt-spray rated thermoset polyester coating.
a. Embedment depth: 0.625 inches or three full threads minimum, whichever is greater.
b. Minimum ultimate pull-out capacity from 18 gauge steel: 450 pounds.

D. Accessories:
1. Bracing, Furring, Bridging, Plates, Gussets, and Clips: Formed sheet steel, thickness as necessary to meet structural requirements for special conditions encountered.
2. Galvanic Protection: Utilize tapes and other methods as necessary to separate and prevent contact between dissimilar metals.

2.3 MINERAL FIBER INSULATION

A. Refer to Section 07 21 00 – Building Insulation.

2.4 SIDING/CLADDING PANEL

A. Refer to Division 07 for cladding materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with manufacturer requirements for installation conditions affecting performance of the work.
1. Do not proceed with installation until unsatisfactory conditions have been corrected.

2. Ensure air barrier/weather-resistant barrier (AB/WRB) is installed prior to installing rainscreen attachment system.
3. Ensure fenestration, transitions, discontinuities, sills, and ledgers are flashed and sealed to move moisture to the exterior of the building.

B. Field verify architectural details and mechanical and electrical requirements prior to commencing installation.

C. Commencement of installation constitutes acceptance of existing conditions and acceptance of responsibility for satisfactory performance.

3.2 RAINSCREEN ATTACHMENT SYSTEM INSTALLATION - GENERAL

A. Preparation: Review areas of potential interference and conflicts and coordinate layout and support provisions for interfacing work.

B. Installation: Install in strict accordance with manufacturer's installation instructions.

C. Primary Girt:
1. Locate stud framing for stud walls.
2. Attach girts at 16 inch on center on support wall (at each stud location).
   a. Tighten screws to substructure to a snug tight condition and not stripped. Do not over-torque beyond manufacturer's recommendation. If installed using hand tools, verify for each installer at beginning of project using snug-tight criteria. Do not use stripped holes.
3. Thermally isolate wall bracket attachments by sandwiching thermal isolation material between metal girt and support wall substrate.
4. Thermally isolate wall anchor fastener using material to thermally isolate fastener heads from metal bracket.
5. Mineral Fiber Insulation: Install to expand into and friction fit between girts as specified by Section 07 21 00 prior to installing horizontal rails.
6. Establish and re-establish and restart girt locations using laser or chalk-line at fenestrations and other obstructions to establish horizontal alignments.

D. Secondary Rail:
1. Space to make suitable bearing surfaces for each cladding system as instructed by manufacturer and as shown on Architect accepted shop drawings.
2. Begin at bottom and mount to girts using No. 14 self-drilling self-tapping stainless steel screws.
3. Tighten screws to snug tight. Verify equivalent snug tight condition for installers using hand tools.
4. Install successive rails as required for panel type and engineering.
5. When encountering fenestrations and other openings, mount rails so that fastening points are as close to the lower and upper edges as possible.

E. Touch-up shop-applied protective coatings damaged during handling and installation.

F. Use shearing instruments (i.e. snips, nibbler, etc.) for cutting metal framing components. Saws are not recommended, as the sparks produced during cutting will damage the anti-corrosion coating. If sparks are generated during cutting, be sure the portion of the component to be installed on the building is protected from sparks and that any stockpile near the cutting station is also protected.

G. The systems components should not be cut while installed on the building, unless using a shearing instrument.

H. Replace thermal isolator pieces that break during installation.

I. Provide a 3/8" – 1/2" gap between girts for expansion when multiple lengths of rail are installed.

J. Minimum length of installed cut girt is 12" and must be attached to the substrate with a minimum of two wall anchors to prevent rotation of girt. Unsupported cantilever must not exceed 8" unless specified differently by manufacturer's engineer.

K. Minimum length of installed cut secondary rail is 12" and must be mechanically attached to at least two separate girts.

L. Maximum Framing Member Variation from True Position: 1/4 inch.

M. Maximum Framing Member Variation from Plane:
1. Individual Framing Members: Do not exceed 1/4 inch in 10 foot.
2. Accumulative Over-all Variation for Wall and Floor System: Do not exceed 1/4 inch.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Technical Service: Make intermittent and final inspection to verify installation in conformance to manufacturer instructions and suitable as framing assembly for subsequent metal panels, acrylic plastering, and other cladding installations.
1. Confirm snug tight and fastener sizing.
2. Confirm framing members installed in correct orientation.

3.4 ADJUSTING

A. Inspect and adjust after installation. Replace or repair defective work.

B. Adjust, and reconfigure as necessary to accommodate cladding systems for installations over work of this Section. Do not reuse pre-drilled holes unless fastener size is increased.

3.5 SIDING/CLADDING PANEL INSTALLATION

A. The cavity must be clear and free from air flow and drainage obstructions.

END OF SECTION

SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Mechanically fastened, UL Class A, white granule surface, modified bitumen sheet roofing system installed over polyisocyanurate and perlite insulation and metal deck.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry: Treated wood nailers, blocking and curbs.
2. Section 07 62 00 - Sheet Metal Flashing and Trim.
3. Section 07 72 13 - Manufactured Roof Curbs and Portals.
4. Section 07 72 33 - Roof Hatches.
5. Division 22 - Plumbing: Roof Drains.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
1. Furnish manufacturer's printed specifications and instructions for installation of system, include applicable temperature range.
2. Include procedures and materials for terminations, flashing, and expansion joints.

B. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Indicate roof configuration, sheet layout, mechanical equipment flashing, expansion joints, termination details, penetration details, parapet wall details, design of tapered insulation system showing layout, slope and thickness of entire system.

C. Sample: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit a 12" x 12" sample of membrane material and each type of fastener.

D. Certificates:
1. Submit manufacturer's certification stating materials ordered and supplied are compatible with each other, suited for locale and purpose intended, and shipped in sufficient quantity to ensure proper, timely installation.
2. Submit manufacturer's approval of proposed fasteners.
3. Submit manufacturer's approval of installer.
4. Submit installer's experience record.
5. Certify materials shipped to site meet membrane manufacturer's published performance requirements.
6. Stating that membrane manufacturer approves of insulation type and method of installation.
7. Indicating that materials specified and details shown conform with manufacturer's requirements for specified warranty.

1.3 QUALITY ASSURANCE

A. Manufacturer:
1. Obtain primary sheet roofing materials from a single manufacturer.
2. Provide secondary materials as recommended by manufacturer of primary materials.
3. Manufacturer's qualified technical representative will be required to visit project site to advise Installer of procedures and precautions for installation of roofing materials and to verify warranty inspection requirements.
4. Provide primary products, including each type of flexible sheet roofing and sheet flashing produced by a single manufacturer, which has produced SBS modified bitumen product successfully for not less than 5 years. Provide accessory products which are acceptable to manufacturers of primary products.

B. Applicator Qualifications: Five years successful experience in installation of roofing systems similar to system for this project and approved by membrane manufacturer.

C. Compatibility or Roofing System: Roof insulation, roof crickets and tapered roof insulation system shall be compatible with the roofing materials to be used and shall be approved by the manufacturer of the membrane roofing materials.

D. Pre-roofing Conference:
   1. At least one week prior to start of roofing installation, convene pre-roofing conference at project site.
   2. Attendance is required by Contractor, Installer, Manufacturer's Technical Representative, Architect, and Program Manager.
   3. Review requirements for work and conditions which could possibly interfere with successful performance of work.
   4. Minimum agenda:
      a. Review project specifications and drawings.
      b. Review weather and working conditions.
         1) Substrate requirements.
         2) Membrane installation.
         3) Roof terminations, flashings, and roof drain requirements.
         4) Mechanical equipment placement, supports, and height requirements.
         5) Inspection, testing, and quality control procedures.
         6) Protection requirements for construction period beyond roofing installation.
         7) Procedures for making roof penetrations after membrane installation.
   5. Conduct tour of roof deck; report discrepancies and problem areas to Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original unopened packaging with legible labels intact.

B. Store materials on site in enclosures or under protective coverings off ground.

C. Do not store material in or on building in such concentrations as to impose excessive strain on deck or structural members.

1.5 PROJECT CONDITIONS

A. Weather:
   1. Proceed with roofing work when existing and forecasted weather conditions permit performance in accordance with manufacturer's recommendations and warranty requirements.
   2. Take special precautions as recommended by manufacturer when applying roofing below 40°F. Ensure cements, adhesives, mastics, and coatings are not affected by freezing weather.

1.6 WARRANTY

A. Furnish written 20-year no dollar limit warranty of materials and workmanship for watertightness extended to include but not be limited to flashings, seams, membrane and penetrations.

B. Warranty shall be signed by membrane manufacturer, agreeing to repair or replace defects in material or workmanship and failure of roof to resist water penetration for a period of ten years from Substantial Completion of project with no dollar limit.

C. Special Project Warranty: Submit 2 executed copies of standard 5-year “Applicator's Roofing Guarantee” on form included at end of this section, covering work of this section including roofing membrane, composition flashing, roof insulation and roofing accessories, signed and countersigned by installer (roofer) and Contractor.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both surfaces.
   1. Compressive Strength: 20 psi
   2. Install in not less than 2 layers of 2.3” min. thickness per board to achieve Thermal Resistance (LTTR value) as designated in Building Envelope Assembly Type drawings.

B. Perlite Board Insulation: ASTM C 728; composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal-coated. Provide a single thickness of 3/4" of perlite insulation.

C. Crickets and Cants: Provide crickets and cants at locations as shown. Cricket and cant must be compatible with built-up roofing material.

D. Tapered Roof Insulation: Provide tapered roof insulation as required to fulfill slope requirements. Tapered roof insulation must be compatible with built-up roofing material. Provide of same material as top layer of insulation.

E. Steep Asphalt: ASTM D 312, Type III.

F. Mechanical Fasteners for Insulation: Screw type on metal deck, Tube-Nail type on light weight insulating decks, length required for thickness of material, with plastic washers and fluoropolymer finish, and approved by membrane manufacturer.

2.2 MODIFIED BITUMEN SHEET ROOFING MATERIALS

A. Product/Manufacturer: Provide 2FID system using one-ply each of DynaBase and DynaGlas FR CR cap sheet as manufactured by Johns Manville International, Inc. or approved equivalent.

B. Sheet Size: Maximum width and length of sheet possible as determined by project conditions and manufacturer's recommendations.

C. Base Sheet: As required by membrane manufacturer.

D. Flashing: Manufacturer's approved bonding adhesive for conditions encountered.

E. Base Flashing: DynaClad AL as manufactured by Schuller Roofing Systems or approved equivalent.

2.3 RELATED MATERIALS

A. Bituminous Materials:
1. As recommended by roofing sheet manufacturer for bonding to substrates and for waterproof sealing of seams.
2. Asphalt Bitumen: ASTM D 312, Type III or Type IV.
3. Asphalt Primer: ASTM D 41.
4. Flashing Cement: ASTM D 4586.

B. Fasteners: Provide fasteners as manufactured by or approved by membrane manufacturer for conditions encountered.

C. Accessories: Provide primers, adhesives, sealants, mastics, prefabricated pipe flashing, roof drain flashing, expansion joint flashing, and appropriate cleaning agents and solvents as recommended by membrane manufacturer for conditions encountered.

D. Expansion Joints: Provide expansion joint approved by the manufacturer where required by membrane system and as detailed on the drawings.

E. Walkway Protection: Provide walkway protection pads around all rooftop mechanical units, at roof hatches, access doors, tops and bottoms of ladders and where shown on drawings in accordance with manufacturer's standards.

F. Roof Vents: Provide FP-10 One-Way Roof Vents as manufacturer by Schuller Roofing Systems or approved equivalent.

2.4 PERFORMANCE/DESIGN CRITERIA

A. Wind Up-lift Requirements: Provide a roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressures calculated according to ASCE-7. Wind uplift pressures for this area, based on a 3-second gust per structural notes and drawings

B. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

2.5 ASPHALT FUME CONTROL

A. It is essential that the fumes resulting from the execution of this work be prohibited from entering any of the existing buildings on campus and minimized in the atmosphere around the campus in the exterior.

B. Contractor may elect any means of his choice to reduce the presence of asphaltic fumes, but the following are the minimum requirements:
   1. Conventional kettle application with approved fume recovery system.
   2. Enclosed tanker application with internal heating element and recycle fume recovery system.
   3. Extension of all existing air intake devices in effected areas to an upwind position.
   4. Providing emergency ventilation of any areas which become areas of complaints by the Owner.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine deck surfaces to receive insulation for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

B. Verify that deck is supported and secured.

C. Verify that deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains.

D. Verify that deck surfaces are dry and free of snow or ice. Verify flutes of metal deck are clean and dry.

E. Verify that roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood cant strips and nailing strips are in place.

F. Examine surfaces scheduled to receive roofing to ensure that they are smooth, dry, and free from oils, grease, and conditions that will adversely affect execution, permanence, or quality of work.

G. Beginning of installation means installer accepts existing substrate.

3.2 PREPARATION OF SURFACES

A. Comply with manufacturer's instructions for substrate preparation.

B. Sweep surfaces upon which sheet is applied, removing loose and foreign materials.

C. Coat metal surfaces with primer or adhesive as recommended by manufacturer.

3.3 INSULATION INSTALLATION

A. Install first two layers (polyisocyanurate insulation) over all areas to receive roof insulation. Mechanically fasten one insulation layer and adhere the second layer of polyisocyanurate insulation.
   1. Apply first layer of insulation with long joints continuous and short joints staggered.
   2. Apply second layer (polyisocyanurate insulation) over first layer in broken joint pattern so that each layer breaks joints both ways with the preceding layer.

B. Apply third layer (perlite insulation) over first layer in broken joint pattern so that each layer breaks joints both ways with the preceding layer.

C. In areas to receive tapered roof insulation or crickets, apply over polyisocyanurate insulation only.

D. Bring insulation panels into moderate contact with each other and cope to fit neatly around projections. Joints parallel to ribs on steel deck installation shall be located over solid bearing.

E. Over steel roof decks mechanically fasten first layer of insulation to the deck throughout. Spacing and number of fasteners shall meet current building code requirements and per ASCE 7 calculations. Adhere remaining layers of insulation.

F. Tapered roof insulation system and crickets shall be installed per manufacturer's instructions as required to meet current building code requirements and per ASCE 7 calculations.

G. Do not install more insulation at one time than the amount which can be covered with roofing the same day.

H. At the end of each day's work and after any other work stoppage, apply temporary water cutoffs in accordance with membrane roofing manufacturer's recommendations.

3.4 MEMBRANE INSTALLATION

A. General:
1. Manufacturer's technical representative is required to be present as necessary to ensure proper installation. Install materials in accordance with manufacturer's printed instructions.
2. Protect other work from spillage of roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace and restore other work damaged by installation of roofing system work.

B. Cutoffs:
1. Coordinate installation of insulation, roofing sheets, flashings, stripping, coatings and surfacings, so that insulation and felts are not exposed to precipitation nor exposed overnight.
2. Provide cut-offs at end of each day's work, to cover exposed felts and insulation with course of coated felt with joints and edges sealed with roofing cement.
3. Remove cut-offs immediately before resuming work.
4. Glaze coat installed ply-sheet courses at end of each day's work where final surfacing has not been installed.

C. Asphalt Bitumen Heating:
1. Heat and apply bitumen in accordance with equiviscous temperature method ("EVT Method") as recommended by National Roofing Contractor's Association and manufacturer.
2. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (±25°F. at point of application) more than one hour prior to time of application.
3. Discard bitumen which has been held at temperature exceeding finished blowing temperature (FBT) for period exceeding three hours.
4. Determine flash point, finished blowing temperature and EVT of bitumen, either by information from bitumen producer or by suitable tests, and determine maximum fire-safe handling temperature and do not exceed that temperature in heating bitumen.
5. Do not heat bitumen to temperature higher than 25°F. below flash point.
6. Keep kettle lid closed except when adding bitumen.

D. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or damage insulation, or other construction. Tape insulation joints.

E. Membrane Installation:
1. Cut sheets to maximum size possible in order to minimize seams.
2. Roll an 18" wide piece of the base felt into a full mopping of bitumen. The remaining felts are to be applied full width, in the same manner, with 3" side and 4" end laps over the preceding sheets.
3. Roll the sheet out onto the deck over the base sheet, inspecting the membrane for defects as it is being rolled out. Allow membrane to relax for 1/2 hour before fastening or splicing. The sheet should be aligned so that it overlaps the previous sheet by the required lap width and then should be rerolled. A mopping of hot asphalt is then to be applied immediately in front of the roll. Roll the membrane into the hot bitumen in a manner that minimizes voids and wrinkles, taking care to ensure proper lap alignment. Membrane laps are sealed together as the sheet is being adhered to the deck. Laps should be fabricated to shed water wherever possible.
4. Lap adjoining sheets: 4" min. side laps, 6" min. end laps.
5. Apply all felts so that they are firmly and uniformly set, without voids, into the hot bitumen. All felt edges shall be well sealed. The bitumen shall be applied just before the felt, at a nominal rate of 25 lbs. per square. When applying over insulations, more than 25 lbs. per square of bitumen may be needed due to the absorbency of the insulation.
6. Install mechanical fasteners where required at spacings recommended by manufacturer.

F. Equipment Curbs:
1. Adhere membrane over equipment supports prior to installation of mechanical equipment.
2. Provide sealant over exposed fasteners.

G. Expansion Joints: Install expansion joints in accordance with manufacturer's recommendations

H. Cant and Tapered Edge Strips:
1. Install performed 45° insulation cant strips at junctures of roofing membrane with vertical surface.
2. Install tapered edge strips at perimeter edges of roofs which do not terminate at vertical surfaces.
3. Set in plastic cement.

I. Set-on Accessories: Where small roof accessories are set in roofing membrane, set metal flanges in bed of roofing cement, and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.

J. Flashing:
1. Install flashings as indicated and recommended by manufacturer.
2. Use longest pieces practicable.
3. Extend splice 3" beyond fasteners which attach membrane to batten strip.
4. Take measures to assure flashing is not ridging where there is change of direction.
5. Fasten top of flashing under metal counterflashing at manufacturer's recommended spacing.
6. Flash penetrations passing through membrane.
7. Use factory prefabricated conduit seals where indicated.
8. When prefabricated pipe seals cannot be used, field fabricate pipe seals.
9. Install fillers around penetrations and fill pocket with non-shrink grout and manufacturer's approved sealer.

K. Roof Drains and Overflow Drains:
1. Fill clamping ring base with heavy coating of roofing cement.
2. Set lead flashing sheet in bed of roofing cement on completed roofing ply sheet courses, with lead sheet clamped in roof drain ring and extended 12" onto roofing.
3. Cover lead sheet with plies extended 4" to 6" beyond edges of lead sheet.

3.5 TERMINATIONS

A. Provide water cutoffs at end of each day's work.

B. Pull membrane loose from water cutoff and remove contaminated material before resuming work.

3.6 WALKWAY PROTECTION

A. Install walkway protection pads as recommended by manufacturer.

END OF SECTION

ROOFING WARRANTY

WHEREAS _____

of (Address) _____

herein called the "Roofing Contractor", has performed roofing and associated work ("work") on following project:

Owner: _____

Address: _____

Name and Type of Building: _____

Address: _____

Area of Work: _____ Date of Acceptance: _____

Warranty Period: _____ Date of Expiration: _____

AND WHEREAS Roofing Contractor has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

NOW THEREFORE Roofing Contractor hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in watertight condition.

This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by: a) lightning, windstorm; b) fire; c) failure of roofing system substrate including cracking, settlement, excessive deflection, deterioration, and decomposition; d) faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work; e) vapor condensation on bottom of roofing; and f) activity on roofing by others including construction contractors, maintenance personnel, other persons, and animals whether authorized or unauthorized by Owner. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Contractor, and until cost and expense thereof has been paid by Owner or by another responsible party so designated.

2. The Roofing Contractor is responsible for damage to work covered by this Warranty, but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.

3. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Contractor, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void upon date of said alterations, but only to extent said alterations affect work covered by this Warranty. If Owner engages Roofing Contractor to perform said alterations, Warranty shall not become null and void, unless Roofing Contractor, prior to proceeding with said work, shall have notified Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this warranty.

4. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void upon date of said change, but only to extent said change affects work covered by this Warranty.

5. The Owner shall promptly notify Roofing Contractor of observed, known or suspected leaks, defect, or deterioration, and shall afford reasonable opportunity for Roofing Contractor to inspect work, and to examine evidence of such leaks, defects, or deterioration.

6. This Warranty is recognized to be the only warranty of Roofing Contractor on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to him in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Contractor of responsibility for performance of original work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

_____
Installation Company

_____
By

_____
Title

_____
Business Address

_____
Telephone Number FAX Number

ATTEST:

_____
Secretary

IN WITNESS THEREOF, this instrument has been duly executed this

_____day of _____, 20____.

(INSERT APPROPRIATE EXECUTION FORM)

* * *

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Sheet metal flashing and trim.

B. Related Sections:
1. Section 07 41 20 - Prefinished Metal Roof Panels.
2. Section 07 52 00 - Modified Bituminous Membrane Roofing.
3. Section 07 92 00 - Joint Sealants.
4. Section 09 91 00 - Painting.

1.2 SUBMITTALS

A. Samples:
1. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Submit for approval samples of parapet coping cover expansion joint and soldered joint.

B. Product Certificates:
1. Showing that each type of coping and roof edge flashing is ANSI/SPRI/FM 4435/ES-1 tested.
2. Showing that each type of gutter securing the perimeter edge of the roof membrane on low-slope (less than 2:12 slope) built-up, modified bitumen and single-ply roofs is ANSI/SPRI GT-1 tested for Test Methods G-1 and G-2.

C. Evaluation Reports:
1. For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.
2. For gutters securing the perimeter edge of the roof membrane on low-slope (less than 2:12 slope) built-up, modified bitumen and single-ply roofs, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI GT-1, Test Methods G-1 and G-2.

1.3 QUALITY ASSURANCE

A. Standard: Comply with the requirements of the Architectural Sheet Metal Manual published by SMACNA.

B. Installer Qualifications: Company specializing in sheet metal flashing work with three years minimum experience in similar sized installations

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle and protect products under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Stack pre-formed material to prevent twisting, bending, and abrasions, and to provide ventilation.

C. Prevent contact with materials which may cause discoloration or staining.

1.5 WARRANTY

A. Furnish to the Owner a written warranty providing the following without cost to the Owner.
1. Sheet metal roof flashings shall be maintained in normal repair and free of leaks for a period of 2 years from the date of acceptance of the roof.
2. At end of 2-year period, Owner and Contractor shall make final inspection of flashing work. Holes, breaks and other defects shall be promptly repaired at the Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Metal:
   1. Roof top accessories, including but not limited to, expansion joint covers, flanges, and concealed counterflashings not visible from ground level shall be stainless-steel, ASTM A 666, unless jurisdiction requires ASTM A 240, Type 304, dead soft, fully annealed, with smooth, flat surface.
      a. Minimum 24 gauge thickness unless noted otherwise.
      b. Finish: 2D (dull, cold rolled)
   2. Areas which can be seen from the ground level, including but not limited to, coping, edging, gutters, conductor heads, downspouts, and expansion joint terminations shall be ASTM A 653, zinc coated (galvanized) copper-bearing steel sheet prefinished with fluorocarbon coating containing 70% Kynar 500. Colors shall be selected by Architect from Fluropon Standard colors as manufactured by Valspar**.**

B. Reglet: Two piece snaplock receiver, Per Figure 4-4C, SMACNA Manual, 8th Edition, of 24 gauge stainless steel**.**

C. Underlayment: ASTM D 226, 30 lb/100 s.f. weight felt containing no additives corrosive to sheet metals.

D. Solder: ASTM B 32, made from block tin and pig lead (50/50) with no antimony.

E. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

F. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

G. Sealant: Two component polyurethane, non-sagging, sealant as specified in SECTION 07 92 00 - JOINT SEALANTS.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

I. Miscellaneous items such as nails and mastic shall be furnished as required by the conditions of use and must be of the best grade available.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, free from distortion and defects, to profiles indicated in accordance with SMACNA Architectural Sheet Metal Manual.

B. Fabricate cleats and starter strips of same material as sheet, interlockable with sheet.

C. Form pieces in longest practical lengths.

D. Hem exposed flashings on underside ½"; miter and seam corners.

E. Solder and seal metal joints except those indicated or required to be expansive type joints. After soldering, remove flux. Wipe and wash solder joints clean.

F. Fabricate corners from one place with minimum 18" long legs; solder for rigidity; seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward ¼" and hemmed to form drip.

H. Fabricate flashings to allow toe to extend minimum 2" over wall surfaces.

I. Fabricate as much as possible in shop with machinery to eliminate as much hand tooling on the job as possible. Shop fabricate to allow for adjustments in the field for proper anchoring and joining.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

C. Verify membrane termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Install starter and edge strips, and cleats before starting installation.

C. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

D. Install one layer of underlayment prior to installing copings.

3.3 INSTALLATION

A. General: Fabricate, assemble, and install sheet metal work in conformance with referenced standard.
   1. Make adequate provision for metal expansion and contraction without buckling or splitting. Use cleats and watertight slip and expansion joints.
   2. Nails and screws shall be of the same metal as the member on which used. Nails through exposed wash surfaces will not be permitted.
   3. When soldering, use flux and wash off surplus flux after soldering has been completed.
   4. Set sheet metal with horizontal lines straight and level. Surfaces shall be flat without wrinkles and waves. Profiles shall align at joints with no offsets.
   5. Conform to drawing details included in manuals published by SMACNA and NRCA.
   6. Edge Securement for Low-Slope Roofs: Design in accordance with ANSI/SPRI ES-1 for basic wind speed zone with 3-second gusts.
   7. Gutter Securement for Low-Slope Roofs: Design in accordance with ANSI/SPRI GT-1 for basic wind speed zone with 3-second gusts.
   8. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
   9. Seal metal joints watertight.
   10. Provide electrolytic separation between dissimilar metals with protective back paint.

B. Reglet: Install surface mounted reglets on walls.
   1. Clean surface of oil, grease and loose particles.
   2. Place sealant bead on back in groove and on lap.
   3. Secure reglet in precise alignment to wall with power driven pins spaced 12" o.c.
   4. Lap joints 3" and bed in sealant. Miter and seal corners.

C. Reglet Counterflashing: Counterflashing for reglet shall be formed of 24 gage metal to fit the reglet in conformance with the manufacturer's instructions.
   1. Lap counterflashing down over flashing strip approximately 4" and form lower edge with a spring bend against the base flashing.
   2. After roofing and flashing strip have been installed, snap counter-flashing up into reglet so that it is held securely in place without screws or clips.
   3. Lap end joints 3" and bed in sealant. Miter and seal corners.

D. Parapet Coping Cover: Form and install coping covers and fascia covers of 24 gage metal. Finish coping covers with a fluorocarbon coating containing 70% Kynar 500. Color shall be selected from Fluropon Standard colors as manufactured by Valspar.
   1. Make up the coping in 10 ft. lengths.
   2. Bend outside bottom edge to form drip and lock to continuous cleat, 22 gage min., secured to wood blocking with nails and to masonry with screws into expansion shields.

3. On roof side copings shall be fastened through slotted holes located 2' o.c. with screws and watertight washers.
4. Provide loose-locked expansion joints filled with sealant where each 10' section meets. Provide an expansion joint within 10 ft. of each corner.
5. Corners shall be mitered, locked and soldered seams.

E. Vent Stack Roof-Penetration Flashing: Flashing shall have a weight range of 2 – 4 lbs/sq. ft. Coordinate installation of roof-penetration lead flashing flange with installation of roofing and other items penetrating roof. Base flashing shall be flanged 4 in. onto the roof. The flange is fastened through the roofing felts and is then stripped in by the roofer. Turn the top of the flashing down inside the vent pipe. Seal with sealant per Section 07 92 00 – Joint Sealants, and clamp flashing to pipes that penetrate roof.

F. Downspout: Form and install downspouts of 24 gage metal.
1. Install with the top slipped up over the outlet sleeve and anchor to the wall with 2" wide by 18 gage metal straps fastened with galvanized bolts into metal expansion shields.
2. For each downspout, set the straps at the top, bottom and at intermediate points spaced not more than 8' apart.

G. Gutter: Form and install hung molded gutters of 26 gage metal at roof eaves. At gutters securing the perimeter edge of the roof membrane on low-slope (less than 2:12 slope) built-up, modified bitumen and single-ply roofs, form and install hung molded gutters of nominal thickness as required to meet performance of SPRI GT-1 requirements.
1. Provide watertight lap or butt type expansion joints at intervals of 50 ft. and not more than 16 ft. from inside and outside corners.
2. Support molded outside edge with 1" wide 18 gage strap hangers at 36" centers and weld to gutter as detailed.
3. Form downspout outlet sleeves and rivet and solder sleeves to gutter. Fit each sleeve with a removable, galvanized wire basket strainer.

H. Fascia/Gutter: Form and install fascia/gutter of 24 gage metal at roof edge where shown.
1. Make up fascia/gutter in 10' lengths with scupper continuously soldered.
2. Install over the single-ply roofing membrane on flashing tape and nail flange with nails spaced in staggered pattern 6" on centers near the back edge.
3. Strip the horizontal flange with another layer of single-ply roofing membrane.
4. Lap end joints 8" and bed in roof cement (roof cement must be approved by single-ply membrane manufacturer). Miter and seam solder the joints at corners before installing them on single-ply membrane.

I. Roof Expansion Joint Cover: Form and install the continuous covers and flashing required to make the roof expansion joints watertight.
1. Install covers over the ice and watershield on wood curbs and nail flanges to the wood curbs in accordance with roofing membrane manufacturer's instructions.
2. Strip the flanges with base flashing as specified in SECTION 07 52 00 - MODIFIED BITUMINOUS MEMBRANE ROOFING.
3. At wall intersections, nail upper vertical flange to wall just below receiver reglet and seal top edge and nail heads with roof cement.
4. Compressible Insulation: Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation In-fill: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on both faces, 1-1/2" thick.
5. Vapor Retarder: Vapor retarder membrane shall be 45 mils EPDM, minimum 24" roll width. Drape vapor retarder down into expansion joint the full depth of the joint, and secure to face of wall and to top of expansion joint curb. Install in continuous length, without joints. Install in-fill insulation per detail.
6. Ice and Watershield Underlayment: Provide Ice & Watershield self-adhered roofing underlayment as manufactured by Grace Construction Products. Extend membrane over expansion joint opening and secure to face of wall and front face of expansion joint curb nailer with screws (do not secure to top of curb).
7. Splice joints and intersections of covers in accordance with the manufacturer's instructions.

J. Miscellaneous flashings and other items of sheet metal roof work shall be provided as required for a weathertight job.

END OF SECTION

SECTION 07 65 00

FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 SUMMARY

A. Flexible stainless steel self-adhering flashing.

B. Related Sections:
1. Section 04 20 00 - Masonry Units.
2. Section 05 40 00 - Cold-formed Metal Framing.
3. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System.
4. Section 07 27 26 - Fluid-Applied Membrane Air Barriers.
5. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.2 REFERENCES

A. Standards of the following as a reference:
1. ASTM.
2. Brick Industry Association (BIA).
3. Recycled content & Recyclability.

B. Federal Government Publications: www.epa.gov/nscep.
1. 40 CFR 59, Subpart D-200 - National Volatile Organic Compound Emission Standards for Architectural Coatings.

C. National Fire Protection Association (NFPA): www.nfpa.org.
1. NFPA 285 – Standard Fire Test Method For Evaluation Of Fire Propagation Characteristics Of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

D. American Architectural Manufacturers Association (AAMA): www.aamanet.org.
1. AAMA 711-20 Voluntary Specification for Self-Adhering Flashing Use for Installation of Exterior Wall Fenestration Products.

E. Sealant, Waterproofing, and Restoration Institute (SWRI): www.swrionline.org.
1. SWRI Validation Program.

F. Industry standards:
1. BIA Technical Notes on Brick Construction No. 7, Water Penetration Resistance- Design and Detailing, November 2017.
2. BIA Technical Notes on Brick Construction No. 28B, Brick Veneer/Steel Stud Walls, December 2005.

1.3 DEFINITIONS

A. Terms:
1. Cavity wall flashing: Same as flexible flashing.
2. Foundation sill flashing: Same as flexible flashing.
3. Flexible flashing: Water-proof material typically used in cavity wall construction to contain and assist in the proper water drainage that may penetrate the wall system veneer. Other materials may be required to constitute the system.
4. Head and sill flashing: Same as flexible flashing.
5. Through-wall flashing:
   a. Generally considered the same as flexible flashing.
   b. Rare definition referred to full-width cap flashing under copings or wall caps.

1.4 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: For each type of product. Indicate material type, composition, thickness, and installation procedures.

C. Shop Drawings: For the following flashing materials that are specially fabricated:
1. Fabricated Flashing: Detail corner units, end-dam units, step flashing and other special applications.

D. Samples:
1. Flexible flashing material, 3" by 5".
2. Premanufactured inside and outside corners.
3. Fabricated step flashing and other special applications.
4. Drip plate, 6” long.
5. Drip plate premanufactured inside and outside corners.
6. Premanufactured end dams, for each application.
7. Termination bar, 6” long.

E. Certificates:
1. From flexible flashing manufacturer, certifying compatibility (including adequate adhesion) of flexible flashing and accessory materials with Project materials that connect to or that come in contact with flexible flashing.
2. Certifying the use of domestic manufactured stainless steel for flashing.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Provide flashing materials by a single manufacturer with not less than twenty-five years of experience in manufacturing flexible flashing products.

B. Materials:
1. Flashing materials must be able to withstand 250º F temperature without changing the long-term performance of the flashing.

C. Pre-installation Conference:
1. At a scheduled pre-installation conference with all trades, contractor shall review flashing for the project and how the flashing shall be sequenced with the following: below grade waterproofing, air and vapor system, window installation, sealant installation, relief angles and roofing.

D. Mock-up:
1. Provide mock-up of complete flashing system, including flexible flashing, drip plate, inside and outside corners, end dams, step flashing, termination bar, flashing/drip plate joints and sealant.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. 20-year manufacturer’s warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Flexible flashing:
1. Basis of Design Product: York 316 SA by York Manufacturing, Inc.
2. Products of manufacturers listed below meeting indicated standards and specified manufacturer's product data characteristics are acceptable for use, subject to compliance with specified requirements.
Momentive; Elemax SS Flashing, type 316
Vapro Shield, Inc.; Vapro-SS Flashing, type 316
Wire Bond; Bond-N-Flash S.A., type 316
York 316 SA
3GEN Masonry Products, Inc.; Genflash SS SA, type 316
NO SUBSTITUTIONS.
3. Characteristics:

a. Type: Stainless steel core with one 2 mils uncoated (bare) stainless steel face (outward facing) bonded to a minimum 8 mils thick adhesive (inward facing), to produce an overall minimum thickness of 10 mils.
b. Stainless Steel: Type 316, ASTM A240. Domestically sourced per DFARS 252.225-7008 and/or DFARS 252.225-7009.
c. Adhesive: Butyl or acrylic.
d. Primer: As required by flashing manufacturer.
e. UV resistant.
f. Fire Resistant: ASTM E84 Class A material.
g. Mold Resistant: Passes ASTM D3273.
h. Passes AAMA 711-20.
i. Passes air barrier material test: ASTM E2178-13.
j. Size: Manufacturer's standard width rolls.

B. Accessories:
1. Sealant, Mastic and Primer: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding and sealing flashing sheets to each other and to substrates.
2. Flashing Corners and End Dams: Type 316 stainless steel, 26 gauge, premanufactured inside/outside corners and end dams.
3. Backer Plate: 6” x 20 ga. galvanized sheet metal backer plate behind sheathing at stud walls, for securing termination bar.
4. Termination Bar: Type 304 stainless steel, 26 gauge termination bar with sealant lip on top edge.
5. Drip Plate: Type 316 stainless steel, 26 gauge, 3” (2-1/2” at King Brick) drip plate with 1/4" 30-degree angled and hemmed outside edge, including premanufactured inside/outside drip plate corners and end dams.
a. Basis of Design product shall be York Stainless Steel Drip Edge. At locations detailed without an exposed angled drip edge, the Basis of Design product shall be York Stainless Steel Drip Edge with non-angled hemmed outside edge.
b. Outside Corners: Basis of Design product shall be York Stainless Steel Drip Edge Corners, fabricated from single piece of sheet metal, without joints or seams. Manufacturer shall grind down point of outside corner to provide an eased corner free from sharp points and edges, prior to shipment of material.
c. Inside Corners, End Dams and Step Flashings: Fabricated from one or two pieces of sheet metal. Seams shall be overlapped, and welded or soldered.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install where indicated, specified, or required according to flashing manufacturer's written instructions and as follows.
2. Prime substrate for installation of flexible flashing if recommended by material manufacturer.
3. Flashing Width: Width of flashing material required starting 3/4" back from the outside face of exterior wythe, extending through the cavity, rising height required to extend above lintel steel at least 2", unless otherwise detailed.
4. Flashing Length:
a. Flexible flashing shall be continuous where possible. Where joints are necessary, splice end joints by overlapping flashing at least 2" and seal with a compatible sealant recommended by flashing manufacturer.
b. Extend flashing 8" (10” at King Brick) beyond openings. At the end of flashing at openings or other horizontal flashing terminations, use premanufactured sheet metal end dam units.
5. Masonry and Concrete Back-up:
a. Surface apply after air barrier or dampproofing installation in accordance with manufacturer's installation instructions.
b. Fasten to masonry backup surface at the top by using a termination bar. Fasten termination bar to masonry back-up at 8” o.c., and seal top edge with compatible sealant recommended by flashing manufacturer.
6. Stud Back-up with Sheathing:
a. Fasten to stud backup at the top using a termination bar.
1) Install continuous galvanized sheet metal backer plate to face of studs, behind sheathing.
2) Fasten termination bar to studs and continuous sheet metal backer plate at 8” o.c.
3) Seal top edge of termination bar with compatible sealant recommended by flashing manufacturer.

7. Drip Plates: Install stainless steel drip plate at all flashing terminations at face of masonry. Install premanufactured corner units at all inside and outside corners. Set drip plates in full bed of sealant.
8. End Dams:
   a. At lintels and heads, extend flashing 8” (10” at King Brick) past opening at each end, and install premanufactured stainless steel sheet metal end dams.
   b. At shelf angles, sills and other horizontal flashing terminations, install premanufactured stainless steel sheet metal end dams at each end.
9. Inside and Outside Corners: Install premanufactured corners from the manufacturer.
10. Step Flashings: Install fabricated stainless steel sheet metal step flashings where through-wall flashings are required to step down to meet detail requirements.
11. Stop membrane 3/4" back from face of masonry and install membrane using hard roller and roll the membrane with constant, firm pressure to ensure uniform contact with the substrate.
    a. Provide guideline on drip plate at 3/4" location to facilitate installation of flexible flashing at proper location, as well as to facilitate Architect’s field observations.
    b. Apply sealant recommended by flashing manufacturer to leading edge of flexible flashing at drip plate as well as at all other termination edges of flashing.
12. Leave ready for air barrier transition flashing, installed in another Section, to be installed over sealed termination bar,.
13. Cavity drainage material, weeps and other masonry accessories shall be installed per Section 04 20 00 Masonry Units.
14. Cover flashing within a few days of installation to protect it from damage from the different trades, the environment, and falling debris. If the flashing is punctured, torn or has loose poly, replace the damaged flashing material.

3.2 SCHEDULES

A. Locations:
1. Exterior door heads.
2. Window heads.
3. Other wall openings.
4. Horizontal control joints.
5. Changes in veneer materials, vertically.
6. Over steel lintels, plates and angles in exterior masonry walls.
7. Within masonry parapets and walls as through flashing to detail.
8. At the bottom of cavity walls with weep holes.
9. Under window sills to detail.
10. Other locations indicated.

END OF SECTION

SECTION 07 72 13

MANUFACTURED ROOF CURBS AND PORTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefabricated roof curbs and penetration portals.

B. Related Sections:
1. Section 05 31 00 - Steel Decking.
2. Section 05 50 00 - Metal Fabrications.
3. Section 06 10 00 - Rough Carpentry: Field-constructed curbs and cants.
4. Section 07 52 00 - Modified Bituminous Membrane Roofing.
5. Section 07 62 00 - Sheet Metal Flashing and Trim: Flashings and counter-flashings.
6. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. General: Submit following items under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Indicating technical and performance data of products.

C. Shop Drawings: Indicating details of special connections and transitions, typical section details, and layout showing intended locations for use of products.

D. Manufacturer's Instructions: Printed instructions for recommended installation methods and sequences for all products.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in the manufacturing of prefabricated roof expansion joints for a minimum of 5 years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Prevent contact with materials which may cause discoloration or staining.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers
1. Roof Curbs: RPS Expansion Curbs (EC-2B, with 2" extended flange), Roof Curbs (RC-2B) and Equipment Rail (ER-2B) by Roof Products and Systems Corp., Bensenville, Illinois.
2. Penetration Portals: Alumi-Flash by Portals Plus, Bensenville, Illinois.
3. Pipe Mounting Pedestal: For pipes 2" to 3-3/4" o.d., provide Model 3-R-2 Pedestals as manufactured by Miro Industries, Inc. Murray, Utah.
4. Pipe Mounting Pedestal: For pipes larger than 2" o.d., provide RPS Pipe Mounting Pedestals as manufactured by Roof Products and Systems Corp., Bensenville, Illinois.

B. Substitutions: Submit in accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 SIZES AND CONFIGURATIONS

A. Provide in sizes and configurations as required to accommodate joint widths, penetrations, and equipment being supported.

B. Provide configurations and special transitions as shown or required to utilize factory formed pieces wherever possible.

C. Provide custom factory-formed pieces conforming to roof slope to allow for a level equipment installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

B. Verify that curbs are level and flashing reglets have been installed at proper locations.

C. Verify that insulation has been packed into joint prior to beginning work.

3.2 INSTALLATION

A. Interface with other systems. On roof mounted expansion joints, set flanges in adhesive and make watertight over cant strip.

B. Install using skilled workmen in accordance with manufacturer's printed instructions and recommendations.

C. Anchor units securely with fasteners and at spacing as recommended by manufacturer.

D. Where metal surfaces are to be in contact with corrosive substrates, apply bituminous coating on concealed metal surfaces.

E. Splice sections of curbs together with procedures as recommended by manufacturer for a solid, watertight installation.

F. Penetrations of piping through equipment curbs shall not be permitted.

G. Utilize factory fabricated intersections and transitions wherever possible. Field fabricate where pre-manufactured sections are not available.

3.3 PROTECTION

A. Protect completed installation under provisions of SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

END OF SECTION

SECTION 07 72 33

ROOF HATCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Roof hatches, including ladder safety post and hatch rail system.

B. Related Sections:
1. Section 05 31 00 - Steel Decking.
2. Section 05 50 00 - Metal Fabrications; angles miscellaneous metal, and ladder fall arrest systems.
3. Section 06 10 00 - Rough Carpentry.
4. Section 07 52 00 - Modified Bituminous Membrane Roofing**.**
5. Section 07 62 00 - Sheet Metal Flashing and Trim: flashing of the hatch curb.
6. Section 07 72 13 - Manufactured Roof Curbs and Portals.
7. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include complete manufacturer's catalog cuts and installation requirements for each item specified.

1.3 WARRANTY

A. Provide manufacturer’s standard warranty. Materials shall be free from defects in material and workmanship for a period of:
1. Roof Hatch: Five years.
2. Ladder Extension: Five years.
3. Roof Hatch Rail System: Five years.

PART 2 - PRODUCTS

2.1 ROOF HATCHES

A. Roof Hatches: Provide single leaf roof hatches, 2'-6" x 3'-0", of 14 gage galvanized/galvannealed steel with 22 gage galvanized/galvannealed steel liner. Product/manufacturer; one of the following:
Model No. BRHU; Babcock-Davis Hatchways Inc.
Type S-20; The Bilco Co.
Model No. SAH-CM-12; Bristolite Daylighting Systems
Model No. RB-1; Milcor Limited Partnership
Model No. RHU; Nystrom

B. Construction:
1. Hatch shall be factory assembled with heavy pintle hinges, compression spring operators, positive snap latch with turn handles, padlock hasps and neoprene draft seals.
2. Curb shall be 12" high with 3½" flanges, fully welded at corners and equipped with integral metal cap flashing.
3. Cover shall be insulated with concealed 1" thick fiberglass insulation.
4. Curb shall be insulated with 1" thick fiberboard insulation. Fiberglass insulation is not acceptable.
5. Cover shall have an automatic hold-open arm with red vinyl grip handle. All hardware shall be cadmium plated.

2.2 LADDER EXTENSION

A. Basis of Design: Provide ladder extension Model LU-2, “LadderUP” Safety post as manufactured by The Bilco Company.
1. 42" high telescoping extension.
2. Post shall lock automatically when fully extended. Release lever shall disengage the post to allow it to be returned to its lowered position.

3. Adjustable mounting brackets shall fit ladder rung spacing and clamp brackets shall accommodate ladder rungs.
4. Balancing Spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lower the safety post.
5. Hardware: All mounting hardware shall be Type 316 stainless steel.
6. Finish: Factory finish of post shall be hot dipped galvanized steel.

2.3 ROOF HATCH RAIL SYSTEM

A. Basis of Design: Where noted on drawings, provide Bil-Guard roof hatch rail system Model RL2-S as manufactured by The Bilco Company.
1. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.29 and shall meet OSHA strength requirements with a factor of safety of two.
2. Posts and rails shall be 1¼" schedule 40 pipe in 6061 T6 aluminum alloy.
3. Hardware shall be Corrosion resistant construction. Locking mechanism is cast aluminum and spring hinges and all fasteners are type 316 stainless steel.
4. Curb mounting brackets and teardrop brackets are 6063 T5 aluminum extrusion. Hinges and post guides shall be 6063T5 aluminum. Fasteners shall be Type 316 stainless steel.
5. Self-closing gate.
6. Color: Safety yellow.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that ladder safety post or hatch rail system installations will not disrupt other trades.

B. Verify that the ladder rungs are dry, clean, and free of foreign matter.

C. Report and correct defects prior to any installation.

3.2 INSTALLATION

A. Roof Hatch: Install roof hatches in accordance with the manufacturer's recommendations. Securely fasten to the roof deck with bolts or screws.

B. Roof Hatch Railing System: Hatch rail system shall attach to the cap flashing of the roof hatch and shall not penetrate any roofing material.

C. Installer shall field check conditions and verify the manufacturer's ladder safety post and hatch rail system details for accuracy to fit the application prior to fabrication.

D. Installer shall comply with the ladder safety post and hatch rail system manufacturer's installation instructions.

E. The manufacturer shall furnish fasteners necessary for installations.

END OF SECTION

SECTION 07 81 16

CEMENTITIOUS FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Direct-to-steel fireproofing sprayed on shop primed steel members, galvanized floor deck, and galvanized roof deck, as scheduled. Material and installation shall conform to the applicable building code requirements of all authorities having jurisdiction.

B. Related Sections:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 05 12 00 - Structural Steel Framing.
3. Section 05 21 00 - Steel Joists Framing.
4. Section 05 31 00 - Steel Decking.
5. Section 09 21 13 - Plaster Assemblies: plaster fireproofing.
6. Section 09 21 16 - Gypsum Board Assemblies: gypsum wallboard fireproofing.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Submit manufacturer's literature of products furnished, including application instructions.
2. Fireproofing Design: Submit copies of each UL Design selected for each required fire resistance rating, including an applicator's certification that each UL Design selected will provide the scheduled fire resistance rating in accordance with the referenced building code.
3. Thickness Schedule: Provide schedule indicating material to be used, building elements to be protected with spray-applied fireproofing, hourly rating, and material thickness provided and appropriate references.

C. Certificates:
1. Provide manufacturer's certification or independent test reports confirming that installed materials meet or exceed performance criteria specified.
2. Provide reports from reputable independent testing agencies, of product proposed for use, which indicate conformance to ASTM E 84 and E 119.
3. Provide manufacturer’s certification that UL Designs selected for the project are not load restricted.

1.3 QUALITY ASSURANCE

A. Applicator: Work shall be performed by a firm acceptable to the cementitious fireproofing material manufacturer.

B. Requirements of Regulatory Agencies:
1. Underwriters' Laboratories, Inc.: Products, execution, and thickness shall conform to approved UL Designs as published in UL Fire Resistance Directory.
2. Testing: Sprayed fireproofing designs shall be as tested and certified to attain specified fire resistance ratings in accordance with ASTM E 119.
3. Local Building Code: Fireproofing material shall have approval of governing code authorities for this building's materials and designs.

C. Pre-installation Conference: Conduct conference at project site. Contractor, fireproofing subcontractor, and independent testing laboratory shall attend a pre-installation conference to review the substrates for acceptability, method of application, applied thicknesses, inspection procedures, and other issues.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original, unopened packages with legible and intact manufacturers' labels identifying products. Include on labels names of products, manufacturers, and date of manufacture. Also include UL labels for fire-resistance ratings applicable to project.

B. Store materials inside, under cover, above ground and in a manner to keep them dry until ready to use. Remove from project site and discard materials that have been exposed to moisture or have otherwise deteriorated.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40°F. and falling. A minimum air and substrate temperature of 40°F. must be maintained during and for 24-hours after application of the spray-applied fireproofing.

B. Protection:
1. Provide ventilation in area to receive fireproofing. Provide ventilation in poorly ventilated areas to achieve a total air exchange rate of 4 times per hour until the material is substantially dry.
2. Provide temporary enclosures to prevent spray from contaminating air or adjacent property.
3. Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting-off of fireproofing.

1.6 SEQUENCING

A. Coordinate installation with other work to avoid cutting and patching of installed fireproofing.
1. Clips, hangers, clamps, sleeves, stops, and other attachments to the substrate shall be installed prior to application of fireproofing.
2. Concrete work on steel floor decking shall be completed prior to application of fireproofing to the underside of the deck.
3. Roofing system, including rigid insulation system on decking, shall be completed prior to application of fireproofing to the underside of the deck.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Sprayed-on Medium Density Cementitious Fireproofing; product/manufacturer:
Monokote Z-106; Construction Products Div., W.R. Grace & Co.
Cafco 400; Isolatek International
Pyrocrete 239; Carboline Company - Fireproofing Products Division.

B. Bonding Agent; Product/Manufacturer:
Fire Bond; Grace Construction Products Div., or approved equivalent.

2.2 SPRAYED-ON FIREPROOFING MATERIALS

A. General: Provide manufacturer's standard applications of standard products complying with requirements indicated below for material composition and physical properties representative of installed products.

B. Material Composition: Cementitious Fireproofing consisting of factory-mixed, dry formulation mixed with water at project site to form a slurry or mortar for pumping and for dispersal by compressed air introduced at spray nozzle. Cement-aggregate formulation, chloride free, composed of Portland cement, additives, and inorganic aggregates. NOTE: Mineral Fiber fireproofing will not be permitted.

C. Physical Properties of Medium Density Fire Proofing: Minimum values, unless otherwise indicated or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed below:
1. Bond Strength: 2000 lbs. per sq. ft. per ASTM E 736.
2. Compressive Strength: 100 lbf. per sq. inch per ASTM E 761.
3. Dry Density: Values for average and individual densities as required to attain fire-resistance rating indicated, per ASTM E 605, but with an average density of not less than 22 pcf.
4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
5. Deflection: No cracking, spalling, delamination or the like per ASTM E 759.
6. Air Erosion: Maximum weight loss of 0.0025 grams per sq. ft. per ASTM E 859.
7. Combustion Characteristics: Passes ASTM E136.
8. Surface Burning Characteristics:
a. Flame Spread: 0
b. Smoke Developed: 0

D. Water: Clean, potable.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surfaces to receive fireproofing shall be free of mill scale, dirt, oil, grease, dust, loose rust, paint or other foreign substances which may impair proper adhesion of the fireproofing to the substrate.

B. Cleaning shall be accomplished just prior to the application of fireproofing.

C. Do not apply fireproofing to surfaces which cannot be corrected by normal cleaning methods. Correct condition before applying fireproofing.

D. Cover other work subject to damage from fall-out or overspray of fireproofing 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.

E. Complete placing of concrete on floor and roof decking prior to application of the fireproofing to the underside of steel deck and supporting beams and joists.

F. On roof decks without a concrete cover, complete all roofing applications and roof mounted equipment installation prior to application of the fireproofing to the underside of roof decking and supporting beams and joists. Prohibit all roof traffic upon commencement of the fireproofing and until the fireproofing material is dry.

G. Commencement of application of fireproofing shall be interpreted as acceptance by the applicator of the suitability of the surface to receive fireproofing material and acceptance of responsibility for failure of bond between fireproofing and steel

3.2 APPLICATION

A. Apply fireproofing in accordance with manufacturer's recommendations for mixing materials, application procedures, and types of equipment used to convey and spray on fireproofing materials; as particular conditions of installation and as required to comply with fire rating requirements and approved UL Designs indicated.

B. Spray apply with as many coats as necessary to obtain required thickness and uniform density.

C. Completely cover members designated to be fireproofed.

D. Install metal lath, as required, to comply with fire-resistance ratings and recommendations of fireproofing manufacturer for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fireproofing. Use anchorage devices of type recommended by fireproofing manufacturer. Attach lathing accessories where indicated or required.

E. Post appropriate cautionary "Slippery When Wet" signs in all areas in contact with wet fireproofing material. Erect appropriate barriers to prevent entry by non-fireproofing workers into the fireproofing spray and mixing areas and other areas exposed to wet fireproofing material.

3.3 FIELD QUALITY CONTROL

A. Field testing will be performed in accordance with SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

B. Testing laboratory shall sample and verify the bond strength, thickness and density of the fireproofing in accordance with the provisions of ASTM E 605, ASTM E 736, and Chapter 17 of the applicable building code.

C. Re-testing required as a result of non-conforming work shall be paid for by the Contractor.

3.4 PATCHING

A. Inspect members for complete coverage, correct unacceptable work, and patch. Chip out areas which are defective or do not bond. Clean steel surface and reapply fireproofing.

B. Patch areas damaged or cut by other work. Patch area from which test samples are taken.

3.5 CLEANING, REPAIR, AND PROTECTION

A. Remove equipment. Immediately after completing spraying operations in each containable area of project, remove material over-spray and fall-out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Cure exposed cementitious fireproofing materials according to fireproofing manufacturer's recommendations to prevent premature drying.

C. Protect fireproofing, according to advice of fireproofing manufacturer and Installer, from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of substantial completion.

D. Coordinate installation of fireproofing with other construction to minimize the need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and patch any areas where fireproofing was removed or damaged.

E. Repair or replace work that has not been successfully protected.

END OF SECTION

SECTION 07 81 23

INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Exposed intumescent fire-resistive coatings, exterior and interior applications.

B. Related Sections:
1. Section 01 45 23 - Testing and Inspection Services.
2. Section 05 12 00 - Structural Steel.

1.2 SUBMITTALS

A. Fireproofing Design: Submit copies of each UL Design selected for each required fire resistance rating, including an applicator's certification that each UL Design selected will provide the scheduled fire resistance rating in accordance with the referenced building code.

B. Product Data: For each type of product indicated.

C. Product Certificates: Submit product certificate for intumescent fireproofing, signed by product manufacturer.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its intumescent fireproofing to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Fire-Test-Response Characteristics: Provide intumescent fireproofing with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL.
1. Fire-Resistance Ratings: Indicated by design designations from UL's Fire Resistance Directory.
2. Surface-Burning Characteristics: ASTM E 84.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to project.

B. Use materials with limited shelf life within period indicated. Remove from project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from project site and discard wet or deteriorated materials.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply intumescent fireproofing when ambient or substrate temperature is 50° F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

PART 2 - PRODUCTS

2.1 EXPOSED INTUMESCENT FIRE-RESISTIVE COATINGS

A. Exposed Interior Areas: Acceptable Manufacturers: Provide one of the following:
A/D Fire Protection Systems Inc.; Firefilm III and Colorcoat.
Albi Manufacturing, Division of StanChem Inc.; Albi Clad TF.
Carboline Company, Fireproofing Products Div.; Thermo-Sorb

B. Exposed Exterior Areas: Acceptable Manufacturers: Provide one of the following:
Albi Manufacturing, Division of StanChem Inc.; Albi Clad 800
Carboline Company, Fireproofing Products Div.; Thermo-Lag E100

C. Topcoat:
1. Provide manufacturer's approved topcoat paint for UL system.
2. Color and Gloss: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.

B. Prime substrates where recommended in writing by intumescent fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive.

C. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of intumescent fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for application procedures, and types of equipment used to convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Extend fire-resistive material in full thickness over entire area of each substrate to be protected.

C. Apply exposed intumescent fire-resistive coatings in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition.

D. Apply intumescent fire-resistive coating as follows:
1. Install reinforcing fabric as required to obtain designated fire-resistance rating.

2. Finish: Even, spray-textured finish produced by lightly rolling flat surfaces of fire-protected members before fire-resistive material dries, to smooth out surface irregularities and to seal in surface fibers.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Testing and inspecting agency will test and inspect as required by the IBC and will interpret tests and state in each report whether tested work complies with or deviates from requirements.
   2. Testing and inspecting agency will perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
   3. Fire protection will be considered defective if it does not pass tests and inspections.
      a. Remove and replace fire protection that does not pass tests and inspections, and retest.
      b. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

3.5 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after application of intumescent fireproofing clean exposed surfaces to remove evidence of soiling.

B. Protect intumescent fireproofing from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

C. Repair or replace work that has not successfully protected steel.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Firestopping for all fire-rated construction complete, including, but not limited to:
   1. Firestopping in conjunction with gypsum board, masonry and plaster partitions.
   2. Firestopping shall include, but not be limited to the following applications:
      a. Sealing gaps between tops of partitions and roof/floor decks.
      b. Sealing gaps between structure and glass curtainwalls with fire safing insulation.
      c. Other locations where "firestopping", "firestop", or "safing" is indicated.
      d. Where required by codes.
      e. Control joints and expansion joints in masonry or gypsum board fire-rated partitions.
      f. Expansion joints in roof and floor assemblies.

B. Related Sections:
   1. Section 04 20 00 - Masonry Units.
   2. Section 07 21 00 - Building Insulation.
   3. Section 07 92 00 - Joint Sealants.
   4. Section 09 21 13 - Plaster Assemblies.
   5. Section 09 21 16 - Gypsum Board Assemblies.
   6. Divisions 23 and 26.

1.2 SUBMITTALS

A. Refer to SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Submit copies of manufacturer's literature. Include data substantiating that materials comply with specified tested system requirements.

C. Samples: Submit duplicate samples of each type of firestopping material and accessories.

D. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgement derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgement drawings must follow requirements set forth by the International Firestop Council.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Do not allow firestopping materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection.

1.4 PROJECT CONDITIONS

A. Do not install firestopping materials until building is completely enclosed and weathertight.

B. Coordinate installation with the work of other trades. Reference SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

PART 2 - PRODUCTS

2.1 PRODUCT/MATERIAL PERFORMANCE REQUIREMENTS

A. Except as otherwise indicated, firestop materials shall be classified in the Underwriters Laboratories (UL) Building Materials Directory, "Section XHEZ-Through-Penetration Firestop Systems", and/or "Section XHHW-Fill Void or Cavity Materials", and “Section XHBN - Joint Systems” for specific project conditions:
   1. Time rating ("F", Fire and "T", Temperature) (T-rating is only required for construction joint systems).
   2. Floor or wall assembly and material.
   3. Penetrating materials/items diameters, or void space.

4. Through opening size.
5. Annular space between penetration opening and penetrating item.

B. Firestopping materials shall provide a fire-rating commensurate with the adjacent construction rating.

C. Firestop materials shall comply with ASTM E 84: Surface Burning Characteristics.

D. Firestop materials shall have been tested in accordance with ASTM E 814, UL 1479 or UL 2079.

E. Firestop materials shall be free of asbestos.

F. Firestop materials shall be paintable or capable of receiving finish materials in those areas which are exposed to view and which are scheduled to receive finishes.

G. Obtain firestop products from a single manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine substrate and conditions under which firestopping work is to be performed, and notify Contractor in writing of any unsatisfactory conditions.

3.2 INSTALLATION

A. Install firestopping materials including foaming, packing and accessory materials to fill openings around penetrations in floors and walls, to seal gaps between decks and partitions, gaps between structure and curtainwall, etc., to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs. Use silicone based materials for all wet or damp conditions.

B. Install firestop materials and systems in accordance with manufacturer's printed instructions and applicable UL Building Materials Directory assemblies.

C. Cut and friction fit fire safing type insulation firestopping to completely fill all gaps and voids. Provide stick-clips, sheet metal closures, and any other accessories to support insulation.

D. Where floor openings are 4" or more in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

E. Remove damming materials after curing if made of other than fire resistant materials.

F. Protect materials from damage on surfaces subject to traffic.

3.3 FIELD TESTING

A. Firestop materials and installation shall be tested by an independent testing laboratory. Refer to SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

B. Where deficiencies are found or penetration and joint firestopping systems are damaged or removed due to testing, repair or replace penetration and joint firestopping systems so they comply with requirements.

C. Proceed with enclosing penetration and joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.4 CLEAN UP

A. Clean up all debris caused by the work of this Section, keeping the premises clean and neat at all times.

B. Clean adjacent surfaces soiled by the work of this section.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Sealing and caulking of joints.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete.
2. Section 04 20 00 - Masonry Units.
3. Section 07 62 00 - Sheet Metal Flashing and Trim.
4. Section 07 84 00 - Firestopping.
5. Section 08 80 00 - Glazing.
6. Section 09 21 16 - Gypsum Board Assemblies.
7. Section 32 13 73 - Concrete Pavement Joint Sealants.

1.2 SUBMITTALS

A. Submit under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, color availability and application instructions.

C. Submit two samples ¼" diameter x 4" in size illustrating color selections available.

D. Submit manufacturer's certificate under provisions of SECTION 01 45 00 - QUALITY CONTROL that products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.

B. Applicator: Company specializing in applying the work of this section with minimum 3 years documented experience and approved by sealant manufacturer.

C. Conform to Sealant and Waterproofers Institute requirements for materials and installation.

1.4 FIELD SAMPLES

A. Provide samples under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Construct one field sample joint, 5 feet long, illustrating sealant type, color, and tooled surface.

C. Locate where directed.

D. Accepted sample may remain as part of the work.

1.5 PROJECT CONDITIONS

A. Environmental Requirements: No caulking shall be done at temperatures below 40°F.

1.6 WARRANTY

A. Furnish to the Owner a written warranty that the sealants shall remain watertight for a period of 2 years from the date of acceptance of the building. Joints which prove defective by leaking, cracking, melting or shrinking of the sealant shall be re-sealed without additional expense to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reference “SEALANT SCHEDULE” at end of this specification section for locations of Sealant Types.

B. Modified Polyurethane (Type 1 Sealant):
1. Two or three-part conforming to ASTM C 920, Type M, Grade NS, Class 25.
2. Color: Custom colors as selected by Architect.
3. Acceptable products:
Sikaflex NP2 (formerly MasterSeal NP2), Sika USA.

C. Pourable Urethane (Type 2 Sealant):
1. Multicomponent conforming to ASTM C 920, Type M, Grade P (pourable), Class 25, Use T (traffic).
2. Color: Custom color as selected by Architect.
3. Acceptable products:
Urexpan NR-200, Pecora Corp.
Sikaflex SL 2 (Formerly MasterSeal SL 2), Sika USA.
THC 900 (Self leveling) or 901 (low sag), Tremco.

D. Silicone, General Purpose (Type 3 Sealant)
1. One-part low modulus rubber based silicone conforming to ASTM C 920, Type S, Grade NS, Class 100/50.
2. Color: As selected by Architect.
3. Acceptable products
Dowsil 790 Silicone Building Sealant, Dow Corning.
SCS2700 Silpruf LM, GE Silicones.
Spectrem 1, Tremco.

E. Polyurethane Hybrid, Paintable (Type 4 Sealant):
1. One-part, moisture-cure, polyurethane hybrid sealant for interior use, conforming to ASTM C 920, Type S, Grade NS, Class 35 and Fed. Spec TT-S-00230C, Class A, Type II.
2. Acceptable product:
Dymonic FC, Tremco

F. Silicone, Sanitary (Type 5 Sealant):
1. One-part conforming to ASTM C 920, Type S, Grade NS, Class 25, F.D.A. Regulation 21 CFR177.2600, and FDA Food Additive Regulation 121.2514.
2. Color: Clear.
3. Acceptable products:
786 Silicone Sealant - M, Dow Corning.
SCS1700 Sanitary, GE Silicones.

G. Acrylic Latex (Type 6 Sealant)
1. One-part, non-sag acrylic latex, siliconized, conforming to ASTM C 834, Type OP, Grade NF or -18° C.
2. Acceptable products:
AC-20+, Pecora Corp.
Tremflex 834; Tremco.

H. Acoustical Sealant (Type 7 Sealant):
1. Acrylic Latex Acoustical sealant for concealed locations.
2. Acceptable products:
AC-20 FTR Acoustical and Insulation Sealant, Pecora Corp.
Acoustical Sealant, Tremco
Sheetrock Acoustical Sealant; USG Co.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D 1056 and C 1330. In vertical joints use closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width. In horizontal joints, use solid neoprene or butyl rubber, Shore A hardness of 70.
   1. At Exterior Insulation and Finish Systems, provide closed cell at both horizontal and vertical joints.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and joint openings are ready to receive work and field measurements are as shown on drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing substrate.

3.2 PREPARATION

A. Joint surfaces shall be clean and dry. Remove loose mortar and other material completely with compressed air or by brushing.
   1. Joints to be caulked shall be at least ¼" wide unless specifically specified smaller. At any point where the width of the joint is appreciably less, cut or grind out the joint to that width to assure an adequate volume of sealant along the length of the joint, except at concrete paving joints, those shall remain ⅛" wide as indicated.
   2. Pack with backing material the voids and recesses around metal frames which are deeper than the depth required for caulking. Leave the proper depth for the sealant.
   3. In open joints and where detailed, install rod stock as backing material. Roll the material into the joints to avoid stretching. The natural thickness of the rod stock shall be approximately twice the thickness of the joint in which it is installed.
   4. In raked masonry joints, apply a bondbreaker strip of polyethylene or masking tape along the bottom of the joints.
   5. Where sealant is to be applied against smooth metal surfaces, wipe these surfaces clean with a suitable ketone solvent immediately prior to caulking.
   6. Particular attention shall be paid to the preparation of horizontal joints in wear surfaces to be filled with sealant. Adjust joint depth to comply with sealant manufacturer's recommendations by malleting down the joint filler or filling in with rod stock as may be required. Joints in concrete paving shall be primed in accordance with manufacturer’s recommendations.
   7. Perform preparation in accordance with ASTM C 1193 for solvent release sealants, C 1193 for latex base sealants, C 919 for acoustical applications, and C 1193 for elastomeric sealants.

3.3 APPLICATION

A. Priming: Prime porous joint surfaces, particularly masonry and concrete. Test the primer to make sure it causes no staining of the material on which it is applied.

B. Depth of sealant: Seal joints to a depth of approximately ½ the joint width, but never less than ¼" deep. Follow the sealant manufacturer's recommendations where possible.

C. Apply the sealant in accordance with the manufacturer's instructions.
   1. Force the sealant into joints with enough pressure to expel all air and provide a solid filling. Correct any flowing or sagging before final inspection is made.
   2. Where adjacent surfaces permit, use masking tape to obtain straight, even lines. Remove tape immediately after the joints have been sealed.
   3. Fill joints flush with adjacent surfaces except where a recessed joint is specifically detailed. Tool beads with a sled runner or similar tool to insure full contact with joint faces.
   4. For caulking horizontal joints in wear surfaces, use a gun with a narrow nozzle. Apply the flow type sealant with the nozzle riding along the bottom so that the sealant is forced up to completely fill the slot without cavities. Provide and use a portable vacuum cleaner to remove loose dirt from the joints just ahead of the caulking gun.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Tool joints concave. Sealant shall achieve a firm skin before surface coating is applied.

3.4 CLEANING/REPAIRING

A. Clean adjacent surfaces of soiling due to caulking operations. This applicator shall be responsible for and shall bear the cost of replacing any material damaged or discolored due to caulking operations.

B. Repair or replace defaced or disfigured finishes caused by work of this section.

3.5 SEALANT SCHEDULE

A. Locations specified below for sealants and caulking required under this section are general and shall not be considered as affecting the required use of sealing compounds specified under other sections of the specifications.

SEALANT TYPE		APPLICATION
1	a.	Vertical control and expansion joints in exterior and unpainted interior masonry surfaces. At joint width 1” or more, reference SECTION 07 95 00 - EXPANSION CONTROL.
	b.	Vertical joints at perimeter of window, door, and storefront elements where adjacent to stone, masonry, or concrete surfaces.
	c.	Reglets: The top groove along the surface-mounted flashing reglets.
	d.	Sealing joints in sheet metal fabrications.
	e.	Unless noted otherwise, any other exterior vertical joints.
2	a.	Interior horizontal control and expansion joints in flooring, stone, masonry and tile flooring and at junctures between these materials and other adjacent materials.
3	a.	Sealing of joints between plumbing fixtures and substrates and between plastic laminate splashes and adjacent tops and walls.
	b.	Threshold and windowsills set in full bed of sealant.
4	a.	General caulking as part of interior painting in joints subject to movement.
	b.	Sealing of joints between tilt-wall panels.
5	a.	Sealing joints between countertops and substrates in concession areas and elsewhere which may be in contact with food.
6	a.	General caulking as part of interior painting.
7	a.	Setting sill track, head track, and end studs to substrates on acoustically rated partitions. Refer to SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES for application requirements.

END OF SECTION

SECTION 07 95 00

EXPANSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Expansion joint assemblies for floor, wall and ceiling surfaces.
2. Preformed, foam joint seals.
3. Preformed, rubber joint seals.

B. Related Sections:
1. Section 03 11 00 - Concrete Forming and Accessories: Expansion and contraction joints in exterior concrete joints.
2. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof control joints.
3. Section 07 92 00 - Joint Sealants: Expansion and control joints.

1.2 SUBMITTALS

A. General: Submit under provisions of SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Provide joint assembly profiles, dimensions, locations in the Work, affected adjacent construction, anchorage devices, available colors and finish, and locations of splices. Provide Manufacturer's Installation Instructions. Indicate rough-in sizes.

C. Certificates:
1. Fire-Rated Expansion Joint Covers: 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.
2. Preformed Joint Seals: Tests performed by manufacturer and witnessed by a qualified testing agency for each preformed joint seal.
3. Warranties: Submit warranty information.

D. Samples:
1. Preformed Joint Seal:
a. Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.
b. Verification: For each type and color of preformed joint seal required, provide samples with joint seals in 2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint seals.
2. Expansion Joint Covers: Submit two 4" long samples, illustrating profile, dimension, color, and finish selected.

E. Templates: For cast-in or placed frames or anchors, and indicate tolerances for item placement.

F. Preformed Joint Seal Schedule: Include the following information:
1. Joint seal location and designation.
2. Joint width and movement capability.
3. Joint seal manufacturer and product name.
4. Joint seal color.

1.3 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.4 WARRANTY

A. Preformed Joint Seal:
1. Special Warranty: Installer agrees to repair or replace preformed joint seals that do not comply with performance and other requirements specified in this Section within specified warranty period.

a. Warranty Period: Two years from date of Substantial Completion.

2. Special Manufacturer's Warranty: Manufacturer agrees to furnish preformed joint seals to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   a. Warranty Period: Five years from date of Substantial Completion.

1.5 EXTRA MATERIALS

A. Furnish under provisions of SECTION 01 78 40 - SPARE PARTS, OVERAGES, AND MAINTENANCE MATERIALS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Expansion Joint Covers: Factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.
   1. Basis-of-design Products for each architectural joint system is based on products by Construction Specialties, Inc. Subject to compliance with requirements, provide either the named products or comparable products by one of the following:
      Architectural Art Mfg. Inc.
      Balco Metalines, Div. of Balco, Inc.
      MM Systems Corp.

B. Preformed, Foam Joint Seals (PJS-1): Manufacturer's standard joint seal manufactured with a primary silicone surface seal factory applied to a secondary closed-cell copolymer ethylene vinyl acetate foam rubber seal. Can accommodate miters and changes in direction with heat weldable transitions. Resistant to UV, ozone, acid rain, most chemicals and extreme temperatures. Meets all applicable standards for compressible sealants. Provide MM Systems Corp. ColorJoint (SCE Series) Siesmic Colorseal, or subject to compliance with requirements, comparable products by one of the following:
      EMSEAL Joint Systems, Ltd.
      MM Systems Corporation.
      Nystrom, Inc.
   1. Design Criteria:

a.	Nominal Joint Width: As indicated on Drawings.		
b.	Tensile Strength	115 psi (+25/-0)	D3575
c.	Ultimate Elongation	225%	D3575
d.	Tear Resistance	20 lbs/in ± 25%	D624
e.	Water Absorption (by weight)	<.02 lbs/sq.ft.	D3575
f.	Density Average	2.7 - 3.2 lbs/cu.ft.	D3575
g.	Movement Capability:	-25 percent/+25 percent.	

   2. Joint Seal Color: As selected by Architect from full range of industry colors.
   3. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.

C. Preformed, Rubber Joint Seals (PJS-2): The expansion joint shall be a continuous low stress multi-web elastoprene compression seal that remains in compression throughout its entire movement cycle. It shall be bonded in place with polyurethane adhesive creating a watertight seal. The rubber seal design shall be bonded in place with polyurethane adhesive creating a watertight seal. The seal shall be supplied in the longest continuous length possible.
   1. Basis of Design Product: Provide MM Systems Corp. Vertical Compression Seal (VCS Series), or subject to compliance with requirements, comparable products by one of the following:
      MM Systems Corporation
      Nystrom, Inc.
   2. Design Criteria:

a.	Nominal Joint Width: As indicated on Drawings.		
b.	Tensile Strength	1000 psi (+75/-0)	D412
c.	Ultimate Elongation	445%	D412
d.	Hardness, Shore A	65 +/- 3 pts.	D2240
e.	Tear Strength	140 pli / 24.5 kN/m @ 23°C	D624
		58 pli / 10.2 kN/m @100°C	D624
f.	Compression set		
	168 hrs.	25% @ 23°C	D395
	168 hrs.	38% @ 100°C	D395

g.	Ozone Resistance	No Cracks	D1149
h.	UV Resistance	Very Good	
i.	Brittle Point	-76°F	D746

3. Joint Seal Color: As selected by Architect from full range of industry colors.
4. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.

D. Substitutions: In accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B 221 6063-T5 alloy for extrusions; ASTM B 308 Alloy 6061-T6, for sheet and plate.

B. Threaded Fasteners: Stainless steel.

C. Primer: Manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials, or provide bituminous paint, impregnated paper or felt, or an alkali-resistant insulating coating.

D. Fire Rated Systems: Fire barrier caulk (SECTION 07 84 00 - FIRESTOPPING), fire blanket, and insulation.

E. Exterior Building Expansion Joint in Masonry Veneer: Provide Compression Seal Expansion Joint Model VCS-225 as manufactured by MM Systems

2.3 FABRICATION

A. All Metal Joint Covers: Aluminum frame construction, free of gaskets and fillers, designed to permit plus or minus 50% joint movement with full recovery, recess mounted.

B. Concealed aluminum surfaces in direct contact with masonry and concrete shall be shop coated with Manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials, or provide bituminous paint, impregnated paper or felt, or an alkali-resistant insulating coating..

C. Galvanize embedded ferrous metal anchors and fastening devices.

D. Shop assemble components and package with anchors and fittings.

E. Provide joint components in single length wherever practical. Minimize site splicing.

2.4 FINISHES

A. Floors: Mill finish.

B. Walls and Ceilings: Clear anodized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces are ready to receive the materials of this section.

B. Verify that joint preparation and affected dimensions are acceptable.

C. Preformed, Foam Joint Seals: Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed-joint seal performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide anchoring devices for installation.

B. Provide templates and rough-in measurements.

C. Preformed, Foam Joint Seals
1. Surface Cleaning of Joints: Clean out joints immediately before installing preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:
   a. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   b. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      1) Concrete.
      2) Masonry.
      3) Unglazed surfaces of ceramic tile.
   c. Remove laitance and form-release agents from concrete.
   d. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. Nonporous joint substrates include the following:
      1) Metal.
      2) Glass.
      3) Porcelain enamel.
      4) Glazed surfaces of ceramic tile.
2. Joint Priming: Prime joint substrates where recommended by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.
3. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 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 components to substrate to prevent misalignment.

D. Install fire-rated systems where required.

E. Installation of Preformed, Foam Joint Seals:
1. Install each length of seal immediately after removing protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

F. Installation of Preformed, Rubber Joint Seals:
1. Remove and repair all unsound substrate. Joint opening sidewall interface areas must be clean and dry prior to installation.
2. Prepare joint opening - surfaces must be sound, dry, by sandblasting free laitance, curing agents or foreign matter.
3. Uncoil seal and allow it to relax in the sun for as long as possible before installation.
4. Joint opening must be blown with compressed air immediately prior to seal installation.
5. Clean and prepare sidewalls of the seal and joint opening interface per the installation guidelines.
6. Apply a thin layer of the polyurethane lubricant adhesive to the sides of the seal (enough to fill the ribs) and to the sidewalls of the expansion joint opening.
7. Install the seal by pushing it into the joint opening with a blunt/flat metal bar.

8. Position seal according to dimensional guidelines.
9. Clean excess adhesive from seal and concrete.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

B. Do not permit traffic over unprotected floor joint surfaces.

C. Provide removable coating to protect finish surface.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 08 11 00

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hollow metal doors and frames, sidelight frames, and borrowed light frames.

B. Related Sections:
1. Section 08 14 23 - Plastic-laminate-faced Wood Doors.
2. Section 08 71 00 - Door Hardware: hardware locations.
3. Section 08 80 00 - Glazing: glass for doors, sidelights, and borrowed lights.
4. Section 09 91 00 - Painting: finishing of hollow metal doors and frames.

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
1. Include door sizes, construction, frame types, wall anchors, and accessories required for installation.
2. Include cable routing diagram through hollow metal doors indicating the cable routing from the power supply to the electric hinge to the electrified locking device.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable local building codes for fire rated requirements of metal door/metal frame and wood door/metal frame assemblies.

B. Fire Rated Door Construction: Conform to NFPA 252 or UL 10C.

1.4 QUALITY ASSURANCE

A. Standard: Provide steel doors and frames complying with the Steel Door Institute ANSI/SDI A250.8 and as herein specified. Hollow metal provider that is not a member of the Steel Door Institute is not approved and must submit product data and samples for review.

B. Fire-Rated Door Assemblies: Provide door and frame assemblies which are identical in materials and construction to units tested in door and frame assemblies per NFPA 252 and which are labeled and listed for ratings indicated by UL. Metal UL classification markers shall be attached to these doors and frames.
1. Test Pressure (positive-pressure testing): After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.

C. Conform to requirements of ANSI/SDI A250.8.

D. Installed frame and door assembly to conform to UL 10C for fire-rated class indicated or scheduled.

E. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal doors and frames to the project site with no dents or open seams and store upright in a protected dry area. Provide packaging and wrapping to protect hollow metal items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide steel doors and frames as manufactured by one of the following:
Ceco Door Products; an ASSA ABLOY Group Co.
Curries Company; an ASSA ABLOY Group Co.

Deansteel Mfg., Inc.
Mesker Door, Inc.
Republic Builders Products Co.
Steelcraft; an Allegion Co.

2.2 MATERIALS

A. Sheet and Strip: ASTM A 1008, commercial quality, leveled, cold-rolled steel free of scale and other surface defects.

2.3 FABRICATION

A. Flush Steel Doors: Full flush type of welded seamless construction with no visible seams or joints on faces or vertical edges.
   1. Exterior Doors:
      a. Extra Heavy Duty; 0.053” thick metallic-coated steel sheet faces (16 ga.); ANSI/SDI A250.8 Level 3; ANSI/SDI A250.4 Performance Level A; Edge Construction Model 2 Seamless.
      b. Provide foamed-in-place polyurethane insulation with maximum U-factor of 0.37 for assembly with frame.
      c. Steel reinforced, stiffened and sound-deadened by laminating insulation completely filling the door and formed steel vertical stiffeners spaced 6" o.c. and attached to face sheets by spot welds and with the spaces between stiffeners filled with insulation material.
      d. Face: Metallic-coated steel sheet, with minimum A60 coating.
   2. Interior Doors:
      a. Heavy Duty; 0.042” thick uncoated steel sheet faces (18 ga.); ANSI/SDI A250.8 Level 2; ANSI/SDI A250.4 Performance Level B; Edge Construction Model 2 Seamless.
      b. Steel reinforced, stiffened and sound-deadened by laminating to small cell impregnated kraft honeycomb core completely filling the door.
   3. Fire Rated Doors: Provide mineral fiberboard core as scheduled and/or as required to meet applicable codes.
   4. Steel thickness is thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.
   5. Continuous vertical interlocking joints on lock and hinge edges with seams continuously welded, filled and dressed smooth. Bevel vertical edges.
   6. Top and bottom edges closed with continuous recessed steel channels spot welded to both faces. Top edge of exterior doors sealed flush with closing channel to exclude water.
   7. Fixed glass moldings welded to security side of door. Loose moldings of 20 gage steel fastened with countersunk flat head screws. Fabricate stops to receive vinyl gaskets.
   8. Overlapping steel astragals for pairs of labeled doors as required by manufacturer to meet codes.
   9. Louvers: Provide factory installed, inverted "V" or "Y" sightproof type fixed louvers. Louver blades shall be 18 gage and frame shall be 18 gage welded construction.
   10. Louvers: Provide factory installed louvers with fusible link closure for use at fire-rated locations, all-welded construction, size as indicated on drawings.

B. Steel Frames: Combination buck, frame and trim type. Provide frames with face width, throat opening, backbend, and jamb depth as per dimensions shown.
   1. Exterior Frames:
      a. Extra Heavy Duty; 0.067” thick metallic-coated steel sheet (14 ga.); SDI A250.8 Level 3; SDI A250.4 Performance Level A.
      b. Continuously welded (full profile welded).
      c. Metallic-coated steel sheet with minimum A60 coating.
      d. Provide foamed-in-place polyurethane insulation with maximum U-factor of 0.37 for assembly with frame.

   2. Interior Frames:
      a. Heavy Duty; 0.053” thick uncoated steel sheet (16 ga.); ANSI/SDI A250.8 Level 3; ANSI/SDI A250.4 Performance Level B.
      b. Continuously welded (full profile welded).
   3. Brake-form to profile free of warp, buckles, and fractures with corners square and sharp. Form stop integral with frame except where detailed otherwise. Dress sheared edges straight and smooth.
   4. Close corner joints tight with trim faces mitered and continuously welded. Dress exposed welds flush and smooth.
   5. Fabricate frames for large openings in knocked-down sections for field assembly with butt joints and internal reinforcing sleeves. Knocked-down frame assemblies shall be trial assembled in the shop.

6. Loose glazing stops shall be 16 gage steel, mitered corners, fastened with countersunk flathead screws. Fabricate stops to receive vinyl gaskets.
7. Weld 14 gage steel floor anchors inside each jamb with two holes each anchor for floor anchor bolts.
8. Furnish frames with steel spreader temporarily fastened to the feet of both jambs for rigidity during shipping and handling.
9. For each jamb in masonry construction provide 3 or more 16 gage adjustable jamb anchors of the T-strap type spaced not more than 30" apart. Furnish yoke type Underwriters anchors for labeled door openings only.
10. For each jamb in steel stud construction provide 4 or more 18 gage drywall type jamb anchors. Weld anchors inside each jamb and wire or bolt to the studs.

C. Shop Finish: After fabrication, doors and frames shall be degreased, phosphatized, and factory painted inside and out with a rust inhibitive synthetic primer. Apply mineral filler to eliminate weld scars and other blemishes.

D. Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes.

E. Reinforce frames wider than 48" with roll formed steel channels fitted tightly into frame head, flush with top.

F. Prepare frame for silencers. Provide three single rubber silencers for single doors and mullions of double doors on strike side, and two single silencers on frame head at double doors without mullions.

G. Attach fire-rated label to each frame and door unit.

H. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight.

I. Fabricate frames for masonry wall coursing with 2" head member.

2.4 HARDWARE PREPARATION

A. Prepare doors and door frames for hardware. Mortising, reinforcing, drilling, and tapping shall be done at the factory for mortised hardware. Reinforcement shall be provided for surface-applied hardware, and the drilling and tapping for this hardware shall be done in the field. Provide plaster guards for hinge and strike reinforcements and cutouts on frames.

B. Reinforcement plates in doors and frames for hardware shall be 7 gage for hinges and 12 gage for all other hardware.

C. Punch for and install rubber silencers on all interior hollow metal door frames. Furnish 3 silencers for each single door and 2 silencers for each pair of doors. Set out and adjust strikes to provide clearance for the silencers. Omit silencers on exterior door frames.

2.5 CLEARANCES

A. Doors shall have pre-fit clearances of:
   1. At Head and Lock Stile: 1/8".
   2. At Hinge Stile: 1/16".
   3. At Door Sill:
      a. Without Threshold: 1/8" from bottom of door to top of decorative floor finish or covering.
      b. With Threshold: 1/8" from bottom of door to top of threshold.
   4. Between meeting edges of pair of doors: 1/8".

B. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80. Bevel fire-rated doors 1/8" in 2" in lock edge.

2.6 ACCESSORIES

A. Rubber Silencers: Resilient rubber.

B. Anchors: Three per jamb, typically, of type to suit supportive construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify surfaces and conditions are ready to receive work of this section. Notify Architect of any existing conditions which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.

3.2 INSTALLATION

A. Install frames in accordance with SDI-105.

B. Install doors in accordance with DHI.

C. Install fire-rated frames and place fire-rated doors in accordance with NFPA 80.

D. Coordinate with masonry and wallboard construction for anchor placement.

E. Coordinate installation of glass and glazing.

F. Install doors accurately in frames, maintaining specified clearances.

G. Setting Frames:
1. Check frames for rack, twist and out-of-square, and correct.
2. Set frames accurately to maintain scheduled dimensions, hold head level and maintain jambs plumb and square.
3. Anchor frames securely to adjacent construction. Anchor to floor at each jamb with two bolts to prevent twist.
4. Leave spreader bars in place until frames have been permanently built into the walls.
5. Install fire-rated frames in accordance with NFPA 80.

H. Hanging Doors:
1. Fit and hang the doors to maintain specified door clearances. Metal hinge shims are acceptable to maintain clearances.
2. Doors shall be out of wind and shall operate smoothly and quietly after adjustment.
3. Place fire-rated doors with clearances as specified in NFPA 80.

3.3 TOLERANCES

A. Maximum Diagonal Distortion: 1/8" measured with straight edge, corner to corner.

END OF SECTION

SECTION 08 14 23

PLASTIC-LAMINATE-FACED WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid core plastic-faced wood doors.

B. Related Sections:
   1. Section 06 40 00 - Architectural Woodwork: laminate clad cabinets.
   2. Section 08 11 00 - Hollow Metal Doors and Frames: hollow metal frames.
   3. Section 08 71 00 - Door Hardware: location of hardware.
   4. Section 08 80 00 - Glazing: glass for doors.
   5. Section 10 21 14 - Plastic Laminate Toilet Compartments.
   6. Section 12 32 16 - Manufactured Plastic-laminate-clad Casework

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Indicate sizes, construction, core materials, edge banding dimensions and stop profile.

C. Product Data: Indicate door core materials and construction; type and characteristics.

D. Samples:
   1. Submit a sample, 6" by 6", of each plastic laminate finish and color selected.
   2. Submit a 12" x 12" sample of solid core door panel indicating construction, core, face and edge detail.
   3. Submit 8-1/2" x 11" paint color samples of door glazing frame paint.

E. Certificates: Submit certification that doors comply with reference standards fabrication requirements, signed by authorized representative of door manufacturer.

1.3 QUALITY ASSURANCE

A. Standard: Comply with the requirements of "Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program" as published by Architectural Woodwork Institute.

B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.4 DELIVERY

A. Deliver doors to the project site ready for installation and to receive hardware. Each unit shall be individually plastic wrapped at the factory for protection in transit and storage.

1.5 WARRANTY

A. Special Warranty: Provide Life-of-Installation warranty on manufacturer’s standard form, signed by manufacturer, installer, and contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section. Warranty shall specifically include installation of replacement doors required during term of the warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide plastic laminate faced wood doors as manufactured by one of the following:

Marshfield-Algoma (Masonite Architectural)

Oregon Door

VT Industries, Inc./Eggers Industries, Architectural Door Div.

2.2 MATERIALS AND FABRICATION

A. Flush Doors: Premium Grade, PC-HPDL-3 (3-ply), as defined in Section 9 of AWI Quality Standards.
   1. Core: Particleboard meeting ANSI A 208.1, Grade LD-2, Urea-Formaldehyde Free.
   2. Stiles: Vertical edges at least 1-1/8" and bonded to core. Species shall be closed grain hardwood with factory-painted finish to match faces. At doors with wood-look plastic laminate faces, stain vertical edges to match faces.
   3. Rails: Top and bottom rail edges at least 1-1/8" and bonded to core. Mill option.
   4. Faces: HGS (nominal 0.048") high pressure decorative laminated plastic conforming to NEMA LD 3. Laminate to be bonded to both faces. Fire-rated plastic laminate faced wood doors shall be surfaced with fire-rated (UL Stamped) laminated plastic sheet. Color shall be as selected by Architect from manufacturer's full color and pattern range. Product/manufacturer; one of the following:
      Formica Brand Laminate; Formica Corp.
      Pionite or Nevamar; Panolam Industries
      Wilsonart; Wilsonart LLC
   5. Stops: Provide shop primed metal glazing frames at all light openings. Fasten by through-bolted countersunk flathead screws. Field painted color as selected by Architect.
   6. Louvers: Provide factory installed, inverted “V” or “Y” sightproof type fixed louvers. Furnish with standard factory baked enamel finish.

B. Fitting:
   1. Cutouts for mortise hardware shall be made to template at the factory.
   2. Top and bottom rail edges and core exposed by cutouts for hardware shall be factory sealed.
   3. Doors shall have pre-fit clearances of:
      a. At Head and Lock Stile: 1/8"
      b. At Hinge Stile: 1/16"
      c. At Door Sill:
         1) Without Threshold: 1/8" from bottom of door to top of decorative floor finish or covering.
         2) With Threshold: 1/8" from bottom of door to top of threshold.
      d. Between meeting edges of pair of doors: 1/8"
   4. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80. Bevel fire-rated doors 1/8" in 2" in lock edge.

2.3 ADHESIVE

A. Facing Adhesive: Type I - waterproof.

2.4 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.

B. Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.

C. Fit door metal edge trim to edge of stiles after applying veneer facing.

D. Bond edge banding to cores.

E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through-bolted hardware.

F. Factory pre-fit doors for frame opening dimensions identified on shop drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify frame opening conditions under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

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.

3.2 PREPARATION

A. Condition plastic faced wood doors to the average prevailing humidity in the building prior to fitting and hanging.

3.3 INSTALLATION

A. General: Installation of doors shall comply with the applicable requirements of Section 1700 Installation of Architectural Woodwork (Interior) of the AWI Quality Standards.

B. Hang doors to maintain uniform clearances. Doors shall be out of wind and shall operate smoothly and quietly after adjustment. Replace doors damaged during installation.

C. Cutting and fitting of plastic laminate faced doors at the project site will not be permitted. Doors which do not fit properly shall be replaced.

D. Pilot drill screw and bolt holes.

E. Machine cut for hardware. Core for handsets and cylinders.

F. Coordinate installation of doors with installation of frames specified in SECTION 08 11 00 - HOLLOW METAL DOORS AND FRAMES and hardware specified in SECTION 08 71 00 - DOOR HARDWARE.

G. Coordinate installation of glass and glazing.

3.4 INSTALLATION TOLERANCES

A. Conform to AWI requirements for fit and clearance tolerances.

B. Maximum Diagonal Distortion (Warp): 1/8" measured with straight edge or taut string, corner to corner, over an imaginary 36" x 84" surface area.

C. Maximum Vertical Distortion (Bow): 1/8" measured with straight edge or taut string, top to bottom, over an imaginary 36" x 84" surface area.

D. Maximum Width Distortion (Cup): 1/8" measured with straight edge or taut string, edge to edge, over an imaginary 36" x 84" surface area.

3.5 ADJUSTING

A. Adjust work under provisions of SECTION 01 77 00 - CLOSEOUT PROCEDURES.

B. Adjust door for smooth and balanced door movement.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 08 31 00

ACCESS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Wall and ceiling access doors.

B. Related Sections
1. Section 03 30 00 - Cast-In-Place Concrete: Openings in concrete.
2. Section 04 20 00 - Masonry Units: Openings in masonry.
3. Section 09 21 16 - Gypsum Board Assemblies: Openings in gypsum board walls and ceilings.
4. Section 09 30 00 - Tiling.
5. Section 09 91 00 - Painting: Field paint finish.
6. Division 22 - Plumbing components requiring access.
7. Division 23 - Mechanical components requiring access.
8. Division 26 - Electrical components requiring access.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include manufacturer's installation instructions.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire-rated access units.

B. Perform work in accordance with UL requirements for fire-rated doors.

1.4 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.5 COORDINATION

A. Coordinate work under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Coordinate the work with mechanical and electrical work requiring access units.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide **wall and ceiling** access doors as manufactured by one of the following:
J.L. Industries, Inc.
Karp Associates, Inc.
Larsen’s Mfg. Co.
Milcor Limited Partnership
Nystrom Building Products Co.

2.2 GENERAL

A. Flush metal panel access doors.

B. Size: As required for ease of access, but not less than 12" x 12".

C. Material:
   1. Model M3202: Painted steel 14 gauge frame and door.
   2. Model MS3202: Stainless steel 16 gauge frame and door.
   3. Models DW3203 and K3200: Painted steel 16 gauge frame; 14 gauge door.
   4. Model ATR3204: Painted steel 16 gauge frame; 18 gauge door.
   5. Fire-Rated Model 3218: Painted and stainless steel 14 gauge frame; 20 gauge door.

D. Lock: Screwdriver operated, with metal cam.

2.3 ACCESS UNITS - WALLS

A. Non-Fire-Rated Door and Frame Unit:
   1. In Cast-in-Place Concrete: Model M3202 (painted) manufactured by Milcor.
   2. In Masonry: Model M3202 (painted) manufactured by Milcor.
   3. In Ceramic Tile on Gypsum Board on Steel Studs: Model MS3202 (stainless steel) manufactured by Milcor.
   4. In Gypsum Board on Steel Studs: Model DW3203 (painted) manufactured by Milcor.
   5. In Plaster on Metal Furring: Model K3200 (painted) manufactured by Milcor.

B. Fire-Rated Door and Frame Unit: 1-1/2 hour UL B label fire rating
   1. In Cast-in-Place Concrete: Model 3218 (painted) manufactured by Milcor.
   2. In Masonry: Model 3218 (painted) manufactured by Milcor.
   3. In Ceramic Tile on Gypsum Board on Steel Studs: Model 3218 (stainless steel) manufactured by Milcor.
   4. In Gypsum Board on Steel Studs: Model 3218 (painted) manufactured by Milcor.
   5. In Plaster on Metal Furring: Model 3218 manufactured by Milcor.

2.4 ACCESS UNITS - CEILINGS

A. Non-Fire-Rated Door and Frame Unit:
   1. In Gypsum Board on Metal Furring: Model DW 3203 manufactured by Milcor.
   2. In Plaster on Metal Furring: Model K3200 manufactured by Milcor.
   3. In Metal T-Bar Ceiling: Model ATR 3204 manufactured by Milcor.

B. Fire-Rated Door and Frame Unit: 1-1/2 hour UL B label fire rating
   1. In Gypsum Board on Metal Furring: Model 3218 manufactured by Milcor.
   2. In Plaster on Metal Furring: Model 3218 manufactured by Milcor.

2.5 ACCESS UNITS - EXTERIOR WALL

A. Provide Model BXT as manufactured by Babcock Davis, 24 Gage Galvanneal Steel door with .080 inch 6063-T5 extruded aluminum frame, size shall be 32” x 48”, stainless steel continuous piano hinge, tested for air and water penetration. Provide latch with mortised lock keyed to building.

2.6 FINISHES

A. Painted Finish: One coat baked enamel primer with baked enamel finish, color as selected by Architect.

B. Stainless Steel: No. 4 finish.

C. Aluminum: Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions under provisions of SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION.

B. Verify that rough openings for door and frame are correctly sized and located.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions and recommendations.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Position unit to provide convenient access to concealed work requiring access.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 08 33 13

COILING COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Coiling counter doors.

B. Related Sections:
1. Section 08 71 00 - Door Hardware: cylinders for coiling door lock and key switch.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

B. Product Data: Submit manufacturer’s product data and installation instructions for each type of coiling counter door. Include both published data and any specific data prepared for this project.

C. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors and accessories. Include relationship with adjacent materials.

1.3 QUALITY ASSURANCE

A. Labeled Construction: Door and frame shall be manufactured in accordance with specifications and procedures for doors and frames tested and rated by Underwriter's Laboratories, Inc. Metal UL classification markers shall be attached to door and frame.

1.4 WARRANTY

A. Manufacturer’s 2-year limited warranty for Overhead Door PowderGuard Premium Powder Coat Finish or approved equivalent.

B. Manufacturer’s 3-year limited warranty for Overhead Door PowderGuard Textured Powder Coat Finish applied to complete door system or approved equivalent.

C. Manufacturer’s 4-year limited warranty for Overhead Door PowderGuard Zinc Powder Coat Finish or approved equivalent.

D. Manufacturer's 5-year limited warranty for Overhead Door PowderGuard Max Powder Coat Finish or approved equivalent.

E.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL COILING COUNTER DOORS

A. Face-of-Wall Mounted coiling door to detail. Product/manufacturer; one of the following:
ESC10; Cornell/Cookson, LLC.
DuraShutter Select; Raynor
651 Series; Overhead Door Corp.
Model 520; Wayne-Dalton Commercial Rolling Doors; Div. Overhead Door Corp.
Model 8325; Windsor Republic Door

B. Curtain: Constructed of interlocking, roll-formed, flat-face stainless steel slats similar to Overhead Door Flat Type F-128 and equipped with a tubular steel bottom bar for reinforcement. All slats shall have malleable iron end locks to act as wearing surfaces in the guides.

C. Guides: Box type fabricated of stainless steel angles and channels.

D. Roller Shaft: Steel pipe with cast iron end plugs and containing an oil tempered, helical counterbalancing steel spring with external adjustment by means of a wheel.

E. Brackets: Heavy cast iron or steel designed to form end closure supports for the hood. Roller shaft ends shall be journaled into bracket hubs and fitted with self-lubricating bronze bearings or sealed ball bearings.

F. Hood: Not less than 20-gage stainless steel formed to fit the contour of the end brackets and reinforced with stiffening rolls at top and bottom edges.

G. Operation: Door shall be counterbalanced for ease of manual push-up operation.

H. Locking: Provide cylinder locks on bottom bar less cylinder for key operation.

I. Finish: The stainless curtain slats, guides, and hood shall have a No. 4 finish. All other exposed metal parts shall have a shop coat of rust inhibitive paint.

2.2 COILING COUNTER DOORS

A. Face-of-Wall Mounted coiling door to detail. Product/manufacturer; one of the following:
ESC10; Cornell/Cookson, LLC.
DuraShutter Standard; Raynor
650 Series; Overhead Door Corp.
Model 500; Wayne-Dalton Commercial Rolling Doors; Div. Overhead Door Corp.

B. Curtain: Interlocking slats, similar to Overhead Door Flat Type F-128 fabricated of 22 gauge galvanized steel. Endlocks attached to alternate slats to maintain curtain alignment and prevent lateral slat movement.

C. Bottom Bar: Single primed steel angle bottom bar with weatherstrip.

D. Guides: 11-gauge roll-formed steel guides with PowderGuard finish to match slats.

E. Roller Shaft: Steel pipe with cast iron end plugs and containing an oil tempered, helical counterbalancing steel spring with external adjustment by means of a wheel.

F. Brackets: Heavy cast iron or steel designed to form end closure supports for the hood. Roller shaft ends shall be journaled into bracket hubs and fitted with self-lubricating bronze bearings or sealed ball bearings.

G. Hood: Provided with intermediate support brackets as required and fabricated of galvanized steel. Finish and color to match curtain.

H. Operation: Door shall be counterbalanced for ease of manual push-up operation.

I. Locking: Provide cylinder locks on bottom bar less cylinder for key operation. Cylinder locking for motor operated doors to include electrical interlock to prevent operation before door is unlocked.

J. Finish:
1. Galvanized Surfaces:
   a. Base Coat: ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat.
   b. Finish Coat: Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Architect; minimum 2.5 mils cured film thickness; ASTM D-3363 pencil hardness: H or better.
2. Ungalvanized Surfaces: Shop coat of rust inhibiting metallic primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coiling counter door shall be installed by skilled mechanics supervised by the manufacturer's authorized representative.

B. Erect the door, guides, and accessories in a rigid substantial manner, straight and plumb, and with horizontal lines level.

3.2 ADJUSTING

A. Adjust the door and operators and leave in good working order.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Coiling doors.
2. Insulated coiling doors.

B. Related Sections:
1. Section 05 50 00 - Metal Fabrications: steel frames for coiling door openings.
2. Section 08 71 00 - Door Hardware: cylinders.

1.2 REFERENCES

A. ANSI/ICC/NSSA Standard for the Design and Construction of Storm Shelters:
1. ICC 500 or ANSI/ICC 500: Appropriate year of ICC 500 shall be year referenced in the applicable IBC “Referenced Standards” Chapter.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

B. Shop Drawings: Include installation details and operating procedures.

C. Product Data and Testing:
1. Insulated Coiling Doors:
a. Provide documentation that doors meet 2021 IECC requirements.
b. Provide Air Leakage Test Report per ASTM E283.
2. Tornado & Hurricane Resistant Coiling Doors: Provide documentation that doors meet requirements of ICC 500.

1.4 QUALITY ASSURANCE

A. Wind Load: Exterior coiling doors shall be constructed to safely resist uniform pressure (velocity pressure) of 43.8 psf.

B. Labeled Construction: Doors required by schedule to be labeled shall be manufactured in accordance with specifications and procedures for doors tested and rated by Underwriter's Laboratories, Inc. Metal UL classification markers shall be attached to these doors.

PART 2 - PRODUCTS

2.1 COILING DOORS

A. Provide face-of-wall mounted coiling door. Product/manufacturer; one of the following:
ESD10; Cornell/Cookson, LLC.
610 Series; Overhead Door Corp.
1. Operation: Motor operator.
a. Motor:
1) Provide high starting torque motor, including motor/gearing cover and spring adjustor cover, of the size and design as recommended by door manufacturer, reduction gearing, solenoid brake, limit switches, emergency hand chain with electrical interlock, magnetic relay contactor, overload protection, prewiring to terminal block, stoplock safety bearing to prevent doors from falling in event of motor damage.
2) 208 V, 3 phase, 60 Hz.
3) Provide key operated control switch.

4) Motor operator shall be equipped with monitored, wireless safety edge in conjunction with the door operator control.

2. Curtains:
   a. Interlocking slats cold roll formed of [galvanized steel] [aluminum] [stainless steel].
   b. End of alternate slats to be fitted with malleable iron endlocks.
   c. Slat design shall satisfy a windload of 20 psf.
   d. Curtain to be reinforced with bottom bar consisting of two angles of galvanized steel. Install weatherseal on bottom of bars.
3. Spring Counterbalance:
   a. House in steel pipe of diameter and wall thickness to restrict maximum deflection to 0.03" per foot of door width.
   b. Springs to be helical torsion type.
   c. Spring tension to be adjustable by means of external adjustment wheel.
4. Bracket Plates: ¼" thick min. steel formed to fit contour of end bracket.
5. Guides:
   a. Structural [galvanized steel] [aluminum] [stainless steel] angles of 3/16" min. thickness.
   b. Fit guides head with two flexible weathering strips (both sides). Door shall not rattle in wind.
6. Hoods:
   a. Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head when not concealed in ceiling. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face.
   b. Fabricated of galvanized steel sheet metal no lighter than 24 gage, laterally reinforced.
   c. Provide intermediate hood supports for hoods exceeding 16'-0".
   d. Fit with internal neoprene header weather baffle.
   e. Fit entire length of hood with internal 4” brush seal with aluminum retainer to act as wind baffle. Door shall not rattle in wind.
7. Locks:
   a. Provide cylinder locks on bottom bars less standard cylinder for key operation. Cylinder locking for motor operated doors to include electrical interlock to prevent operation before door is unlocked.
8. Finish:
   a. Galvanized Surfaces:
      1) Base Coat: ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat.
      2) Finish Coat: Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Architect; minimum 2.5 mils cured film thickness; ASTM D-3363 pencil hardness: H or better.
   b. Ungalvanized Surfaces: Shop coat of rust inhibiting metallic primer.
9. Weatherstripping: Door to be fully weatherstripped at sill, hood, and at guides.

2.2 INSULATED COILING DOORS

A. Basis of Design: Provide “Thermiser Max ESD30” face-of-wall mounted insulated coiling door as manufactured by Cornell/Cookson/Clopay, LLC or approved equivalent. Door shall meet 2021 IECC criteria.
   1. Operation: Motor operator.
      a. Motor:
         1) Provide high starting torque motor, including motor/gearing cover and spring adjustor cover, of the size and design as recommended by door manufacturer, reduction gearing, solenoid brake, limit switches, emergency hand chain with electrical interlock, magnetic relay contactor, overload protection, prewiring to terminal block, stoplock safety bearing to prevent doors from falling in event of motor damage.
         2) 208 V, 3 phase, 60 Hz.
         3) Provide key operated control switch.
         4) Motor operator shall be equipped with monitored wireless safety edge in conjunction with the door operator control.
   2. Curtains:
      a. Flat-faced, insulated, interlocking slats cold roll formed of [galvanized steel.
      b. End of alternate slats to be fitted with malleable iron endlocks.
      c. Slat design shall satisfy a windload of 20 psf.
      d. Curtain to be reinforced with bottom bar consisting of two angles of galvanized steel. Install weatherseal on bottom of bars.
      e. Door shall meet 2021 IECC requirement of 0.31 max U-Value for opaque doors.

f. Backing slats of gray CPVC.

3. Spring Counterbalance:
   a. House in steel pipe of diameter and wall thickness to restrict maximum deflection to 0.03" per foot of door width.
   b. Springs to be helical torsion type.
   c. Spring tension to be adjustable by means of external adjustment wheel.
4. Brackets:
   a. Fabricate from minimum 3/16” steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
   b. Doors shall not rattle in wind.
   c. Finish: Powder Coat: Zirconium treatment followed by a gray baked-on polyester powder coat; minimum 2.5 mils cured film thickness.
5. Guides:
   a. Structural [galvanized steel] [aluminum] [stainless steel] angles of 3/16" min. thickness.
   b. Fit guides with two flexible weathering strips (both sides). Door shall not rattle in wind.
6. Guide Seal (Thermal Break): Foam block to seal the area between the outer angle and wall angle if an “E” guide is used and outer guide angle and the wall if a “Z” guide is used.
   a. Foam Block: Compression fit F3061 foam block, EPDM, closed cell, low density
      1) Meets ASTM D 1056 2A1 requirements.
      2) 2A1 foam shall be closed cell, non-oil resistant EPDM, with a 2-5psi.
      3) UL listed for gasket and seal.
      4) Service temperature of -103 deg F to 220 Deg F.
7. Hoods:
   a. Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head when not concealed in ceiling. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face.
   b. Fabricated of galvanized steel sheet metal no lighter than 24 gage, laterally reinforced.
   c. Provide intermediate hood supports for hoods exceeding 16'-0".
   d. Fit with internal neoprene header weather baffle.
   e. Fit entire length of hood with internal 4” brush seal with aluminum retainer to act as wind baffle. Door shall not rattle in wind.
8. Locks:
   a. Provide cylinder locks on bottom bars less standard cylinder for key operation. Cylinder locking for motor operated doors to include electrical interlock to prevent operation before door is unlocked.
9. Finish:
   a. Galvanized Surfaces:
      1) Base Coat: ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat.
      2) Finish Coat: Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Architect; minimum 2.5 mils cured film thickness; ASTM D-3363 pencil hardness: H or better.
   b. Ungalvanized Surfaces: Shop coat of rust inhibiting metallic primer.
10. Weatherstripping: Door to be fully weatherstripped at sill, hood, and at guides.
    a. Bottom Bar:
       1) Motor Operated Doors: Sensing/weather edge with neoprene astragal extending full width of door bottom bar
    b. Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain
    c. Lintel Seal: Double brush seal with EPDM sandwiched between the two brush seals at door header to impede air flow.

2.3 INSTALLATION

A. Coiling doors shall be installed by skilled mechanics supervised by the manufacturer's authorized representative.

B. Erect the doors, guides, and accessories in a rigid substantial manner, straight and plumb, and with horizontal lines level.

2.4 TESTING AND ADJUSTING

A. Upon completion of installation, put all items through at least ten operating cycles. Make required adjustments and assure that components are in optimum operating condition.

END OF SECTION

SECTION 08 36 13

SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Glazed Aluminum Sectional Overhead Doors.
2. Electric Operators and Controls.
3. Operating Hardware, tracks, and support.

B. Related Work
1. Section 08 33 13 - Coiling Counter Doors
2. Section 08 33 23 - Overhead Coiling Doors
3. Section 08 71 00 - Finish Hardware; Key cylinders for locks.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCTS DATA, AND SAMPLES.

B. Product Data: Submit manufacturer's product data and installation instructions. Include both published data and any specific data prepared for this project.

C. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent material.

1.3 QUALITY ASSURANCE

A. Design Criteria: Sectional overhead doors shall be fabricated and installed to safely resist a wind load of 22 psf.

B. Manufacturer: Sectional doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of sectional doors.

C. Installer: Installation of sectional doors shall be performed by the authorized representative of the manufacturer.

D. Single-Source Responsibility: Provide doors, tracks, and accessories from one manufacturer. Provide secondary components from source acceptable to manufacturer of primary components.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from weather damage, excessive temperatures, and construction operations.

PART 2 - PRODUCTS

2.1 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

A. Basis of Design: Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.
1. Door Assembly: Stile and rail assembly secured with 1/4 inch diameter through rods.
2. Panel Thickness: 1-3/4 inches.
3. Center Stile Width: 2-11/16 inches.
4. End Stile Width: 3-5/16 inches.
5. Intermediate Rail Pair Width: 3-11/16 inches.
6. Top Rail Width: 3-3/4 inches.

7. Bottom Rail Width: 4-1/2 inches.
8. Insulated Rails and Stiles: Provide polyurethane insulation in stiles and rails with 4.1 R-value (available up to 18'-2" wide).
9. Aluminum Panels: 0.050 inch thick, aluminum.
10. Stiles and Rails: 6063 - T6 aluminum.
11. Springs: 100,000 cycles.
12. Glazing: 1/2 inch Tempered Low-e Insulated Glass.
13. Anodized Finish: Powder coating.
14. Windload Design: Provide to meet the Design/Performance requirements specified.
15. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
16. Lock: Interior galvanized single unit. Standard right-hand installation, prepared for cylinder described in another section of this specification.
17. Weatherstripping: Flexible bulb-type strip at bottom section.
18. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
19. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
    a. Entrapment Protection: Required for momentary contact, includes radio control operation.
    b. Electric sensing edge monitored to meet UL 325/2010.
    c. Operator Controls: Push-button operated control stations including open, close, and stop buttons with key lock. Control switch shall be mounted on the secure side of the opening.
    d. Surface mounting.
    e. Interior location.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine areas to receive sectional overhead doors for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Sectional overhead doors shall be installed by skilled mechanics supervised by the manufacturer's authorized representative.

B. Erect the doors, tracks, and accessories in a rigid substantial manner, straight and plumb, and with horizontal lines level.

C. Adjust locking mechanism for extra tight weather seal at door bottom.

3.3 ADJUSTING

A. Adjust the doors and tracks and leave in perfect working order.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Aluminum entrance and storefront systems with associated aluminum doors.

B. Related Sections:
1. Section 07 92 00 - Joint Sealants: caulking of perimeter joints.
2. Section 08 71 00 - Door Hardware; hardware for aluminum doors.
3. Section 08 80 00 - Glazing.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Include drawings showing elevations of each entrance and storefront type, detail sections of typical composite members, and glazing details.

C. Samples: Submit for approval duplicate samples showing the limits of color range to which the entrance, storefront, and door materials will be processed. Samples shall be representative of the materials to be furnished, and the color of the installed materials shall be within the range of the approved samples.

D. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.

1.3 SYSTEM DESCRIPTION AND PERFORMANCE

A. Architectural Requirements
1. Drawings are diagrammatic and do not purport to identify or solve problems of thermal or structural movement, glazing or anchorage.
2. Requirements shown by details are intended to establish basic dimensions of units, sightlines and profiles of members.
3. Provide concealed fastening wherever possible.
4. Provide continuous snap-in thermally-broken aluminum backer plate at head and jamb conditions.

B. Structural Requirements
1. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170°F. without causing detrimental effects to system or components.
2. Design and size members to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with building code, and measured in accordance with ANSI/ASTM E 330.
3. Limit mullion deflection to L/175, or flexure limit of glass with full recovery of glazing materials, whichever is less.
4. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.
5. Storefront manufacturer shall be responsible for design and engineering of storefront system, including necessary modifications to meet specified requirements and maintaining visual design concepts.
6. Attachment considerations shall 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.
7. Design anchors, fasteners and braces to be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
8. Engineer storefront and entrances to be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

C. Environmental Requirements

1. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior. No leakage shall occur in wall when tested in accordance with ASTM E 331 at test pressure of 6.24 lbs/sq ft.
2. Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of assembly surface area, measured at a reference differential pressure across assembly of 1.57 lbs/sq ft. as measured in accordance with ANSI/ASTM E 283.
3. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor maximum of BTU/Sq.Ft. x h x deg F as listed below and determined according to NFRC 100.
    1) Storefront: 0.45 Btu/sq.ft. x h x deg F
    2) Storefront Doors: 0.77 Btu/sq.ft. x h x deg F
4. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

1.4 QUALITY ASSURANCE

A. Erector Qualifications: Erection of the entrance and storefront systems and doors shall be by an experienced erector approved by the manufacturer.

B. Design Criteria:
1. Deflection of glass framing members under design loads shall not exceed L/175 or ¾", whichever is less.
2. Deadload deflection of horizontal glass framing members shall not exceed 0.125".
3. Exterior Entrances and Storefront: Design windload shall be 22 psf.

C. Perform work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle system components under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS.

B. Store and protect system components under provisions of SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

C. Provide wrapping to protect prefinished aluminum surfaces.

1.6 COORDINATION

A. Manufacturer shall be responsible for details and dimensions not controlled by job conditions and shall show on his shop drawings required field measurements beyond his control.

B. Coordinate with responsible trades to establish, verify and maintain field dimensions and job conditions.

1.7 ENVIRONMENTAL CONDITIONS

A. Do not install sealants when ambient temperature is less than 40°F. during and 48-hours after installation.

1.8 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate within specified warranty period.
1. Failures include, but are not limited to, the following:
    a. Structural failures including, but not limited to, excessive deflection.
    b. Noise or vibration caused by thermal movements.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    d. Water leakage through fixed glazing and framing areas.
    e. Failure or operating components to function properly.
2. Warranty Period: 2 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide aluminum entrances and storefronts as manufactured by one of the following:
EFCO Corp.
Kawneer North America
Oldcastle Building Envelope
Tubelite, Inc
YKK AP America, Inc.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B 221; AA 6063-T5 alloy, temper.

B. Sheet Aluminum: ASTM B 209; 5005-H34 alloy, temper; or other alloys and temper recommend by manufacturer appropriate for specified finish.

C. Sheet Steel: ASTM A 446; hot-dipped galvanized.

D. Steel Sections: ASTM A 36; shapes to suit mullion sections.

E. Primer and Touch-Up Primer for Galvanized Surfaces: High-zinc-dust-content paint complying with SSPC-Paint 20.

F. Fasteners: Stainless steel.

2.3 FABRICATED COMPONENTS

A. General: Form section true to details with clean, straight, sharply defined profiles, free from defects impairing strength or durability.

B. Framing:
1. Framing Types Basis of Design shall be Kawneer:
a. Exterior: Provide the following thermally broken framing systems where shown on drawings.
1) 2” x 4-1/2” Framing System: Kawneer Trifab® VG ™ 451T
b. Interior: Provide the following framing systems where shown on drawings.
1) 2” x 4-1/2” Framing System: Kawneer Trifab® VG ™ 450
2. Fabricate the aluminum entrance and storefront systems with the shapes and sections detailed.
3. Design the glass framing system to minimize loads on the glass due to building movement and incorporate provisions for thermal expansion by means of expansion joints. Where insulating glass is to be installed, design the glass framing system so that moisture does not accumulate in the glazing channel for prolonged periods.
4. Construction: Mill joints to a hairline fit. Assemble and connect members to form rigid, watertight assemblies. No exposed fastenings will be permitted. Reinforce the framing internally as required to meet the design criteria specified above.
5. Continuous Solid Closures: Fabricate required closures and covers to detail of aluminum sheet, plate, and angles. Provide solid continuous thermally-broken backer plate closures at head and all jambs.
6. Accessories: Provide glazing gaskets, flashing, and miscellaneous shims and other parts detailed or otherwise required to complete the work.
7. Provide manufacturer's standard closure plate at perimeter framing members to cover open side of framing member against surrounding construction. Provide solid aluminum head channel at head condition per drawings.

C. Doors: Kawneer 500IR Heavy Wall Doors and Heavy Wall Framing System. The aluminum doors shall be wide-stile type with 5" stiles, 6-1/2" top rail, 5" intermediate rail (centered on panic device) and 10" bottom rail; plus square glazing stops. Construction: Doors shall be mortised and have reinforced welded corner construction with hairline watertight joints. Fastenings shall be concealed.
1. Doors shall be factory fabricated by aluminum entrance and storefront manufacturer.
2. Glazing Beads: Fixed or theft proof snap-in glazing beads on exterior or security side of doors. Interior glazing beads shall be snap-in type. All glazing beads shall have vinyl inserts and glazing gaskets.
3. Weatherstripping: Continuous contact weatherstripping on stiles and top rails of exterior doors.

D. Hardware Preparation: Prepare and reinforce doors and door frames for hardware.
   1. Mortising, reinforcing, drilling, and tapping for mortised hardware shall be done at the factory.
   2. Wherever possible, concealed steel reinforcement for surface-applied hardware shall be installed at the factory. The drilling and tapping for surface-applied hardware shall be done in the field.

E. Reinforced Mullion: Same profile as non-reinforced frames, of extruded aluminum cladding with internal reinforcement of steel shaped structural section.

F. Flashings:
   1. Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oilcanning"; of proper alloy to match the finished extrusions.
   2. Subsill Flashing: Provide manufacturer's standard high-performance, thermally-broken aluminum subsill flashing with integral weep holes. End dams shall be manufacturer's standard fiberglass, plastic or thermally-broken aluminum end dams.

G. Extruded Aluminum:
   1. Framing System: Principal extrusions shall have a minimum wall thickness of 0.08". Moldings, trim, and glass stops shall be not less than 0.050" thick.
   2. Doors and Door Framing System: Principal extrusions shall have a minimum wall thickness of 3/16". Moldings, trim, and glass stops shall be not less than 0.050" thick.

H. Reinforcement: Concealed reinforcements for hardware in doors and frames and mullions shall be plated or galvanized steel and shall be secured in place. If Heavy Wall doors are not specified, then provide continuous reinforcement at continuous geared hinges.

I. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.

J. Rigidly fit and secure joints and corners with internal reinforcement, except that door corners will be welded. Make joints and connections flush, hairline, and weatherproof.

K. Develop drainage holes with moisture pattern to exterior.

L. Prepare components to receive anchor devices. Fabricate anchorage items.

M. Arrange fasteners, attachments, and jointing to ensure concealment from view.

N. Prepare components with internal reinforcement for door hardware.

O. Reinforce framing members for imposed loads.

2.4 HARDWARE

A. Weatherstripping: Provide manufacturer's standard weatherstripping continuous at head, jamb, sill, and meeting stile.

B. Refer to SECTION 08 71 00 - DOOR HARDWARE for balance of hardware.

2.5 FINISHES

A. Finish coating to conform to AAMA 611. Finish for aluminum entrances, storefronts, frames, and doors match.

B. Aluminum Finish: Exposed aluminum surfaces of entrances, storefronts, frames, and doors and all their associated parts shall be Architectural Class I AA-M10C22A44 Hard Coat Color Anodic Coating Dark bronze color, .7 mil minimum. Screw and bolt heads exposed to view shall be finished to match the exposed aluminum surfaces.

C. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A 123 to 2.0 oz/sq ft.

D. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive entrances and storefronts for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

B. Field check dimensions, elevations, and slopes on the connecting work affecting the entrance and storefront to assure a proper fit and weathertight installation.

C. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.

3.2 INSTALLATION

A. Install wall system, doors, and glazing in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window.

B. Erecting Storefronts: Erect the members to be plumb, level, square and in proper alignment with other work, and free from sags, waves and buckles.
   1. Materials shall be accurately cut and fitted and rigidly anchored in place to resist safely all normal stresses to which the work will be subjected.
   2. Cut and machined ends and recesses shall be true, accurate and free of burrs and rough edges.
   3. Provide subsill extrusions positioned to collect water leakage through mullions and storefront. Subsill shall drain to the exterior. It shall run continuously across the opening width. The ends are sealed with end dams.
   4. Create end dams at ends of window heads, sills, at edges of storefronts, and other vertical elements to channel water to nearest weep hole away from window mullions and other items which might allow water to travel vertically.
   5. Provide clearance around the perimeter between entrance and storefront metal and the opening substrate (concrete, masonry, or stucco) for caulking.

C. Hanging Doors: Fit the doors with hardware and hang to operate smoothly, without bind or chatter.
   1. Where concealed reinforcement for hardware cannot be provided, install and use Riv-Nuts for fastening surface applied hardware.
   2. Use sex bolts and nuts for fastening closers and closer arms to aluminum doors.
   3. The use of sheet metal or self-tapping screws to mount hardware is prohibited.

D. Sealing Joints: Seal the metal-to-metal framing joints properly in conformance with the manufacturer's standard procedure.

E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install hardware using templates provided. Refer to SECTION 08 71 00 - DOOR HARDWARE for installation requirements.

G. Install glass and infill panels in accordance with SECTION 08 80 00 - GLAZING, using exterior dry method of glazing.

H. Install perimeter 2 part polyurethane type sealant, backing materials, and installation requirements in accordance with SECTION 07 92 00 - JOINT SEALANTS.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06" every 3' non-cumulative or 1/16" per 10', whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32".

3.4 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.5 PROTECT AND CLEAN

A. Protection of Aluminum:
   1. Protect concealed aluminum surfaces that will contact masonry, concrete and steel with neoprene gaskets or a coat of bituminous paint to prevent galvanic and corrosive action.
   2. If drainage of moisture from incompatible metal passes over aluminum, paint the incompatible metal with a coat of aluminum pigmented paint.
   3. Protect finished aluminum surfaces from staining by gypsum and cement materials until all adjacent masonry and plaster work has been completed.

B. Cleaning: Upon completion of the work, wash down aluminum surfaces with water and soft cloths and leave in first class condition.

END OF SECTION

SECTION 08 45 23

INSULATED TRANSLUCENT SANDWICH PANEL WALL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the insulated translucent sandwich panel system and accessories, factory unitized, as shown and specified. Work includes providing and installing:
   1. Flat factory prefabricated structural insulated translucent sandwich panels
   2. Aluminum installation system
   3. Aluminum sill flashing
   4. 1” insulated glass where indicated in opening schedule

B. Related Sections:
   1. Section 04 22 00 - Concrete Unit Masonry.
   2. Section 07 92 00 - Joint Sealants.
   3. Section 08 80 00 - Glazing.

1.2 SUBMITTALS

A. Submit manufacturer’s product data. Include construction details, material descriptions, profiles and finishes of 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 Code Council Evaluation Report (ICC-ES)
      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. Insulation U-Factor (NFRC 100)
      j. NFRC System U-Factor Certification (NFRC 700)
      k. Solar Heat Gain Coefficient (NFRC or Calculations)
      l. Condensation Resistance Factor (AAMA 1503)
      m. Air Leakage (ASTM E 283)
      n. Structural Performance (ASTM E 330)
      o. Water Penetration (ASTM E 331)
      p. 1200F Fire Resistance (SWRI)
      q. ASTM E1886/1996 or TAS 201, 202 and 203
      r. Performance for Windows (AAMA/WDMA/CSA-101/I.S.2/A440-05)

1.3 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 the International Code Council – Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an approved 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 AC04 “Sandwich Panels” or AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as regulated by the ICC-ES.

B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.4 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete unitized panel system.
1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads; Provide system capable of handling the following loads:
   a. Positive Wind Load: 30 PSF

B. Windborne Debris Impact Resistance Performance for translucent panels in southern elevations
1. Translucent panels must be impact-resistant meeting the requirements of an approved impact-resisting standard: ASTM E 1996 and ASTM E 1886 or TAS 201, 202 and 203.
2. Panel System designed to meet Missile Type C per ASTM E 1996.

1.5 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.

1.6 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 leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering and defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The basis for this specification is the “VertiKal” product manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers’ names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein. Acceptable Manufacturers: Skywall Inc. and Major Industries.

B. Kalwall Corporation is furnished and installed by Griesenbeck Architectural Products 5122 Steadmont Dr. Houston, TX 77040 713.781.3287 www.griesenbeck.com

2.2 PANEL COMPONENTS

A. Face Sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
   a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
   b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
2. Interior face sheets:
   a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
   b. Burn extent by ASTM D 635 shall be no greater than 1".
3. Exterior face sheets:
   a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 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.
   b. Strength: Exterior face sheet shall be uniform in strength, with panel meeting ASTM E1996 and ASTM E1886 or TAS 201, 202 and 203.
4. Appearance:
   a. "Exterior face sheets of south facing panels: Smooth .052" thick and white in color. Exterior face sheets of all other panels: .070" thick and white in color.
   b. Interior face sheets: Smooth .045" thick and crystal in color.
   c. 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

2.3 PANEL CONSTRUCTION

A. Provide 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: 18%
   3. Solar heat gain coefficient 0.24
   4. Panel U-factor by NFRC certified laboratory: 2-3/4" aluminum grid 0.29.
   5. Complete insulated panel system shall have NFRC certified U-factor of 0.42.
   6. Grid pattern: Nominal size 10' x 5', pattern: Refer to drawings.

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. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system: Standard 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: Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Custom color to be selected by Architect.

2.5 WINDOWS

A. Windows shall be designed specifically for inclusion in the translucent panel unit wall system and factory unitized to panels. Units shall be of the following type(s):
   1. Fixed lite 1” insulated glass with maximum Solar Heat Gain Coefficient of 0.25 and maximum “U” factor of 1.22

B. Construction: All window frame members and sash shall be of tubular extruded 6063-T5 aluminum. Frame and sash to have enhanced thermal performance and mechanical strength using polyamide Insulbar® thermal strut construction. Frame sections shall be mitered and joined using heavy internal aluminum corner gussets that are mechanically staked and epoxy sealed. All openings are double sealed using continuous EPDM bulb, foam and wedge weather stripping to insure minimum air infiltration and maximum water resistance. Both project-out and fixed lites to have snap-in aluminum glazing bead for ease of field glazing.

C. Glazing:
   1. Glazing Specification: Fixed lite 1” insulated glass with maximum Solar Heat Gain Coefficient of 0.25 and maximum “U” factor of 1.22

D. Finish is to be coordinated with closure system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.2 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.

3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's 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.

3.4 CLEANING

A. Clean the panel system inside and outside, immediately after installation.

B. Refer to manufacturer's written recommendations.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood and hollow metal doors.

B. Thresholds.

C. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 081116 - Aluminum Doors and Frames.

C. Section 081213 - Hollow Metal Frames.

D. Section 081416 - Flush Wood Doors.

E. Section 081433 - Stile and Rail Wood Doors.

F. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. 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; 2019.

C. BHMA A156.1 - Standard for Butts and Hinges; 2021.

D. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

E. BHMA A156.3 - Exit Devices; 2020.

F. BHMA A156.4 - Door Controls - Closers; 2019.

G. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

H. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

I. BHMA A156.7 - Template Hinge Dimensions; 2016.

J. BHMA A156.16 - Auxiliary Hardware; 2018.

K. BHMA A156.21 - Thresholds; 2019.

L. BHMA A156.22 - Standard for Gasketing; 2021.

M. BHMA A156.26 - Standard for Continuous Hinges; 2021.

N. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2018.

O. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

P. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

Q. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

R. DHI (KSN) - Keying Systems and Nomenclature; 2019.

S. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

T. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.

U. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

V. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

W. ITS (DIR) - Directory of Listed Products; Current Edition.

X. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

Y. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

AA. UL (DIR) - Online Certifications Directory; Current Edition.

BB. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

CC. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.

DD. UL 1037 - Antitheft Alarms and Devices; Current Edition, Including All Revisions.

EE. UL 1610 - Central-Station Burglar-Alarm Units; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
1. Architect.
2. Installer's Architectural Hardware Consultant (AHC).
3. Hardware Installer.
4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
1. Schedule meeting at project site prior to Contractor occupancy.
2. Attendance Required:
   a. Contractor.
   b. Owner.
   c. Door Hardware Installer.
   d. Owner's Security Consultant.
3. Agenda:
   a. Establish keying requirements.
   b. Verify locksets and locking hardware are functionally correct for project requirements.
   c. Verify that keying and programming complies with project requirements.
   d. Establish keying submittal schedule and update requirements.
4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   a. Key control system requirements.
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
   a. Submit in vertical format.
3. Include complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Samples for Verification:
   1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
   2. Submit one (1) sample of hinge, lockset, and closer illustrating style, color, and finish.
   3. Include product description with samples.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

K. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

N. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.
   4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Closers:
   1. Provide door closer on each exterior door, unless otherwise indicated.
   2. Provide door closer on each fire-rated and smoke-rated door.
   3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

D. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.

E. Weatherstripping and Gasketing:

F. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
   a. Aluminum fasteners are not permitted.
   b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
   a. Self-drilling (Tek) type screws are not permitted.
3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
   a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
   b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
5. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
6. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

A. Manufacturers: Conventional butt hinges.
1. BEST; dormakaba Group: www.bestaccess.com/#sle.
2. Hager; Hager Companies: https://www.hagerco.com/home.
3. McKinney; Assa Abloy: https://www.mckinneyhinge.com/en.
4. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html
5. Substitutions: Not permitted.

B. Properties:
1. Butt Hinges: As applicable to each item specified.
   a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
   b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
   c. Template screw hole locations.
   d. Bearing assembly installed after plating.
   e. Bearings: Exposed fully hardened bearings.
   f. Bearing Shells: Shapes consistent with barrels.
   g. Pins: Easily seated, non-rising pins.
      1) Fully plate hinge pins.
      2) Non-Removable Pins: Slotted stainless steel screws.
   h. UL 10C listed for fire-resistance-rated doors.
2. Continuous Hinges: As applicable to each item specified.
   a. Geared Continuous Hinges: As applicable to each item specified.
      1) Non-handed.
      2) Anti-spinning through-fastener.
      3) UL 10C listed for fire-resistance-rated doors.
         (a) Metal Door Installation: Rated up to 90 minutes.
         (b) Wood Door Installation: Rated up to 60 minutes.
      4) Sufficient size to permit door to swing 180 degrees

C. Sizes: See Door Hardware Schedule.
   1. Hinge Widths: As required to clear surrounding trim.
   2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.
   1. Fully polish hinges; front, back, and barrel.

E. Grades:
   1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
   2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.

F. Material: Base metal as indicated for each item by BHMA material and finish designation.

G. Types:
   1. Butt Hinges: Include full mortise hinges.
   2. Continuous Hinges: Include geared hinges.

H. Quantities:
   1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
      a. Hinge weight and size unless otherwise indicated in hardware sets:
         1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
         2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
         3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
         4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
   2. Continuous Hinges: One per door leaf.

I. Applications: At swinging doors.
   1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

J. Products:
   1. Butt Hinges:
      a. Ball Bearing, Five (5) Knuckle.
   2. Continuous Hinges:
      a. Aluminum geared hinges.

2.04 BOLTS

A. Manufacturers:
   1. Trimco: www.trimcohardware.com/#sle.
   2. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
   3. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Flush Bolts:
      a. Automatic Flush Bolts: Automatically latching upon closing of door leaf.
         1) Bolt Throw: 3/4 inch (19 mm), minimum.
   2. Dustproof Strikes: For bolting into floor, provide except at metal thresholds.

C. Options:
   1. Lever extensions: Provide for top bolt at oversized doors.

D. Products:
   1. Automatic flush bolts.

2.05 EXIT DEVICES

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.Corbin Russwin; Assa Abloy: https://www.corbinrusswin.com/
   2. Von Duprin; Allegion PLC:https://www.vonduprin.com/en/index.html.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Actuation: Full-length touchpad.
   2. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.
   3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.
   4. Lever Design: Match project standard lockset trims.
   5. Cylinder: Include where cylinder dogging or locking trim is indicated.
   6. Strike as recommended by manufacturer for application indicated.
   7. Sound dampening on touch bar.
   8. Dogging:
      a. Non-Fire-Resistance-Rated Devices: Cylinder 1/4 inch (6 mm).
      b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
   9. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.
   10. All exposed exit device components to be of architectural metals and “true” architectural finishes.
   11. Handing: Field-reversible.
   12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
   13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.

C. Grades: Complying with BHMA A156.3, Grade 1.
   1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

2.06 LOCK CYLINDERS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Substitutions: Not permitted.

B. Properties:
   1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
      a. Provide cylinders from same manufacturer as locking device.
      b. Provide cams and/or tailpieces as required for locking devices.
      c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:
   1. Standard Security Cylinders: Comply with BHMA A156.5.

D. Material:

E. Types: As applicable to each item specified.
   1. Standard security small format interchangeable core (SFIC) type cylinders, with seven-pin, 1CM-7 cores.

F. Applications: At locations indicated in hardware sets, and as follows
   1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
      a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

G. Products:
   1. Rim/mortise.

2.07 MORTISE LOCKS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Substitutions: Not permitted.

B. Properties:
   1. Mechanical Locks: Manufacturer's standard.
      a. Fitting modified ANSI A115.1 door preparation.
      b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
      c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
         1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
      d. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
      e. Backset: 2-3/4 inch (70 mm).

f. Lever Trim:
1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
3) Spindle: Designed to prevent forced entry from attacking of lever.
4) Independent spring mechanism for each lever.
(a) Trim to be self-aligning and thru-bolted.
5) Handles: Made of forged or cast brass, bronze, or stainless steel construction. Levers that contain a hollow cavity are not acceptable.
6) Levers to operate a roller bearing spindle hub mechanism.

C. Finishes: See Door Hardware Schedule.
1. Core Faces: Match finish of lockset.

D. Grades:

E. Options:
1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.

F. Products: Mortise locks, including standard and electrified types.
1. 40H.

2.08 CYLINDRICAL LOCKS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties:
1. Mechanical Locks:
a. Fitting modified ANSI A115.2 door preparation.
b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
1) Through-bolted anti-rotational studs.
d. Cast stainless steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.
e. Bored Hole: 2-1/8 inch (54 mm) diameter.
f. Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
g. Latch: Single piece tail-piece construction.
1) Latchbolt Throw: 9/16 inch (14.3 mm), minimum.
h. Cylinders:
1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
(a) Small format interchangeable.
i. Lever Trim:
1) Style: See Door Hardware Schedule.
2) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
3) Strength: Locksets outside locked lever designed to withstand minimum1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
4) Independent spring mechanism for each lever.
(a) Contain lever springs in the main lock hub.
5) Outside Lever Sleeve: Seamless one-piece construction.
6) Keyed Levers: Removable only after core is removed by authorized control key.

C. Finishes: See Door Hardware Schedule.
1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty.
1. Durability: Passing 50 Million cycle tests verified by third party testing agency.

E. Material: Manufacturer's stadard for specified lock.
1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
2. Outside Lever Sleeve: Hardened steel alloy.

F. Options:

G. Products: Cylindrical locks, including mechanical and electrified types.
   1. 9K (Grade 1).

2.09 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
   1. Trimco: www.trimcohardware.com/#sle.
   2. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
   3. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
   4. Substitutions: Not permitted.

B. Properties:
   1. Pull Type: Straight, unless otherwise indicated.
   2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
      a. Edges: Beveled, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: Stainless steel, unless otherwise indicated.

E. Products:
   1. Push-Pull Plates.

2.10 COORDINATORS

A. Manufacturers:
   1. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html
   2. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
   3. Substitutions: Not permitted.

B. Properties:
   1. General: Non-handed devices, with field-selectable active door leaf.

C. Grades:

D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
   1. Meet UL 10C for Positive Pressure.

E. Types:

F. Installation:
   1. Mounting: Provide necessary mounting brackets and filler bars to ensure proper installation of coordinator and related hardware.
   2. Coordination: Properly sequence installation of other door hardware affected by placement of coordinators and carry bars.

2.11 CLOSERS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. dormakaba, dormakaba Group: https://www.dormakaba.com/
   3. Sargent; Assa Abloy: https://www.sargentlock.com
   4. LCN; Allegion PLC: https://www.lcnclosers.com/en/index.html.
   5. Substitutions: Not permitted.

B. Properties:

C. Grades:
   1. Closers: Comply with BHMA A156.4, Grade 1.
      a. Underwriters Laboratories Compliance:
         1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
            (a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

D. Types:
   1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.

E. Options:
   1. Advanced backcheck.

F. Installation:
1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
3. At outswinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

2.12 PROTECTION PLATES

A. Manufacturers:
1. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
2. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
3. Substitutions: Not permitted.

B. Properties:
1. Plates:
a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
b. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
1. Metal Properties: Stainless steel.

E. Installation:
1. Fasteners: Countersunk screw fasteners

2.13 STOPS AND HOLDERS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
3. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
4. Substitutions: Not permitted.

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Grades:
1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

D. Material: Base metal as indicated for each item by BHMA material and finish designation.

E. Types:
1. Wall Bumpers: Bumper, concave, wall stop.
2. Floor Stops: Provide with bumper floor stop.

F. Installation:
1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

G. Products:
1. Wall Bumpers.
2. Floor Stops.

2.14 THRESHOLDS

A. Manufacturers:
1. National Guard Products, Inc: www.ngpinc.com/#sle.
2. Pemko; Assa Abloy: https://www.pemko.com/en/products/gasketing/perimeter-gaskets.
3. Substitutions: Not permitted.

B. Properties:
1. Threshold Surface: Fluted horizontal grooves across full width.

C. Grades: Thresholds: Comply with BHMA A156.21.

D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.

2.15 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. National Guard Products, Inc: www.ngpinc.com/#sle.
   2. Pemko; Assa Abloy: https://www.pemko.com/en/products/gasketing/perimeter-gaskets.
   3. Substitutions: Not permitted.

B. Properties:
   1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

C. Grades: Comply with BHMA A156.22.

D. Products:
   1. Weatherstripping: See Door Hardware Schedule.
   2. Door Bottom Seals:
      a. Door Sweeps: See Door Hardware Schedule.

2.16 KEYS AND CORES

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Substitutions: Not permitted.

B. Properties: Complying with guidelines of BHMA A156.28.
   1. Provide small format interchangeable core.
   2. Provide Patented CORMAX keys and cores.
   3. Provide keying information in compliance with DHI (KSN) standards.
   4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
   5. Keying: Master keyed.
   6. Include construction keying and control keying with removable core cylinders.
   7. Supply keys in following quantities:
      a. Master Keys: 4 each.
      b. Construction Master Keys: 6 each.
      c. Construction Keys: 15 each.
      d. Construction Control Keys: 2 each.
      e. Control Keys if New System: 2 each.
   8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
   9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
   10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
   11. **Owner to install all permanent cores** and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:
   1. Patented:
      a. CORMAX.

2.17 KEY CABINETS

A. Manufacturers:
   1. Lund Equipment Company, Inc: www.lundkey.com/#sle.
   2. Telkee: www.telkee.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Properties:.
   1. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
   2. Security Key Tags: For each keyed lock on project, provide one set of matching key tags for permanent attachment to one key of each set.
   3. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
   4. Mounting: Wall surface mounted.

5. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
6. Key cabinet lock to facility's keying system.

C. Finishes: Baked enamel, manufacturer's standard color.

D. Material: Sheet steel.

E. Products:
1. Lund.
2. Telkee.

2.18 FIRE DEPARTMENT LOCK-BOXES

A. Manufacturers:
1. Knox Company; Knox-Box Rapid Entry System www.knoxbox.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
1. Heavy-duty, recessed, solid steel box with hinged door and interior gasket seal; single drill-resistant lock with dust covers and tamper alarm.
2. Capacity: Holds 10 keys.
3. Construction complying with UL 1037, UL 1610, and UL 437.

C. Locations:
1. **One recessed unit at main entrance.**
2. **Two surface mounted units at locations directed by COH**

D. Finishes: Manufacturer's standard coating.
1. Color: Manufacturer's standard dark bronze.

E. Options:. As applicable to each item specified.

F. Products:
1. Knox.

2.19 FINISHES

A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
2. For Steel Door Frames: See Section 081213.
3. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
4. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
5. Flush Wood Doors: See Section 081416.
6. Stile and Rail Wood Doors: See Section 081433.

7. Mounting heights in compliance with ADA Standards:
   a. Locksets: 40-5/16 inch (1024 mm).
   b. Push Plates/Pull Bars: 42 inch (1067 mm).
   c. Deadlocks (Deadbolts): 48 inch (1219 mm).
   d. Exit Devices: 40-5/16 inch (1024 mm).
   e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.07 DOOR HARDWARE

Manufacturer list

BES Best
PRE BEST (Precision)
NGP National Guard Products
TRI Trimco

Option list

Code:	Name:
S	Single Keyed Classroom
D	Storeroom
AVB	Advanced Variable Backchk
3	2-3/4" Backset
B4E Heavy	Heavy Bevel Edges
V	Vandal Resistant lever trim
Mullion	Provide at the mullion
AB	Entrance
VIBE	Double Visual Indicator
PATD	Patented keyed core
V4908	Key controls lever
16	16 adjustable size 1-6
2	Standard Length
10"	Height
7	7 Pin
X 2" LDW	Width
3	Push Plate 4" x 16"
PHI	Anti-Vandal Pull
4" ODW	4" Over Door Width
4	Standard Mortise
L	Privacy Function
PATD	Patented
CD	Cylinder Dogging: 1-1/4" Mortise Cylinder not included
N	Passage
B2	UL Stop Mounted Coordinator
4914	Lever/knob always active
Head & Jambs (2)	Provide at the head and both jambs
0	Keyless
3B	Pull Plate 4" x 16" with 10" CTC Pull
LM	Lost Motion
LAR	Length As Required
NRP	NON-REMOVABLE PINS
CSK	Counter Sunk Holes

Finish list

Code:	Name:
	Black Silicone
B	Brown
689	Aluminum
32D	Satin Stainless Steel
A	Anodized Aluminum
26D	Satin chromium plated
630	Satin stainless steel
626	Satin chromium plated

Specification Report

Set #101

Doors: C104, C148, C148A, C132, C147A

6.0	Hinge	FBB191 NRP 45X45	32D	BES
1.0	Keyed Removeable Mullion	KR822	689	PRE
2.0	Exit Device	2103 CD CA-03	630	PRE
2.0	Pull	1097 PHI	630	TRI
2.0	Mortise Cylinder	1E 7 4 PATD	626	BES
3.0	Rim Cylinder	12E 7 2 PATD	626	BES
2.0	Door Closer	EHD90 16 SDS90	689	BES
2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
1.0	Drip Cap	16 4" ODW	A	NGP
1.0	Gasketing	5100N Mullion		NGP
1.0	Gasketing	700S Head & Jambs (2)	A	NGP
2.0	Sweep	200S LAR	A	NGP
1.0	Threshold	8425 LAR	A	NGP

Set #102

Doors: C147, C108, C152A, C148B, C130B, C101

6.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Keyed Removeable Mullion	KR822	689	PRE
2.0	Exit Device	2108 CD D V4908	630	PRE
3.0	Rim Cylinder	12E 7 2 PATD	626	BES
2.0	Mortise Cylinder	1E 7 4 PATD	626	BES
2.0	Door Closer	EHD90 16 SDS90	689	BES
2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
1.0	Gasketing	5100N Mullion		NGP
2.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #103

Doors: C102

6.0	Hinge	FBB179 45X45	26D	BES
2.0	Exit Device	2814 V 4914 A	630	PRE
2.0	Door Closer	EHD90 16 AF90P	689	BES
2.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
2.0	Dome Stop	1211	630	TRI

Set #104

Doors: C136

6.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Flush Bolt	3820x3810	626	TRI
1.0	Strike	3910	626	TRI
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
2.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Coordinator	3090 SERIES	626	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
2.0	Dome Stop	1211	630	TRI

Set #105
Doors: C111

6.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Flush Bolt	3820x3810	626	TRI
1.0	Strike	3910	626	TRI
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
2.0	Door Closer	EHD90 16 SIS90	689	BES
2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
1.0	Coordinator	3090 SERIES	626	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #106
Doors: C150, C131, C11

6.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Flush Bolt	3820x3810	626	TRI
1.0	Strike	3910	626	TRI
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
2.0	Door Closer	EHD90 16 SDS90	689	BES
2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
1.0	Coordinator	3090 SERIES	626	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #107
Doors: C119, C151, C122A, C105

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #108
Doors: C141A, C125, C112, C122B, C144, C141, C153

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #109
Doors: 139, C150#1

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #110
Doors: C109

3.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Exit Device	2108 CD D V4908	630	PRE
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Mortise Cylinder	1E 7 4 PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #111
Doors: C130C, C130A, C130

3.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Exit Device	2108 CD D V4908	630	PRE
1.0	Mortise Cylinder	1E 7 4 PATD	626	BES
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #112
Doors: C133

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Deadbolt	8T 3 S PATD	626	BES
1.0	Push Plate	1001 3	630	TRI
1.0	Pull Plate	1018 3B	630	TRI
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #113
Doors: C121, C120, C118, C138, C133A, C138A

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Deadbolt	8T 3 S PATD	626	BES
1.0	Push Plate	1001 3	630	TRI
1.0	Pull Plate	1018 3B	630	TRI
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #114
Doors: C127, C126, C145, C146, C107

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Mortise Lock	45H 0 L 14 H VIBE	630	BES
1.0	Deadbolt	8T 3 S PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #115
Doors: C105A

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 0 N 15 D	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #116
Doors: C128, C129

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 0 N 15 D	626	BES
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #117
Doors: C124, C123, C116, C115, C117, C106

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 AB 14 C LM PATD	626	BES
1.0	Dome Stop	1211	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #118
Doors: C147#1

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	700S Head & Jambs (2)	A	NGP
1.0	Sweep	200S LAR	A	NGP
1.0	Threshold	8425 LAR	A	NGP

Set #119
Doors: 318, C150A, C103B, 362, 370, C148C, C148D, C152AC, C152N, C152AB, C152AA, C152Z, C152Y, C152V, C152U, C152T, C152S, C152R, C152AF, C152AG, C152AH, C152L, C152J, C152G, C152E, C152C, C152B, C152Q, C152II, C152JJ, C152PP, C152SS, C160, C159A, C152HHH, C152III, C152JJJ

1.0	Hardware	BY OTHERS

Set #120
Doors: 103, 104, 29, 30, 32, 102, 116, 117, 118, 119, 120, 122, 123, 124, 135, 136, 137, 138, 144, 146, 314, 27, C148#1, 350, 356, 369, 372, 33, 36, 37, C152ZZ, C152AAA, C152BBB, C152DDD, C152FFF, C152GGG, C152KKK, C152LLL

Set #121 - C134
Doors: C134, C135, C139, C140

1.0	Cased Opening	CASED OPENING

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 21 14

GLASS-FIBER-REINFORCED GYPSUM ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefabricated glass fiber reinforced gypsum column covers.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include copies of manufacturer's literature completely describing prefabricated glass reinforced gypsum members, joint reinforcement and fastener concealment components, anchors, adhesives, and test data substantiating conformance with contract documents.

B. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include drawings showing locations, sizes and shapes of members, proposed jointing arrangements, details of anchorages and supports.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver store and handle prefabricated glass reinforced members in conformance with manufacturer's instructions.

1.4 PROJECT CONDITIONS

A. Coordinate delivery and installation of prefabricated glass reinforced gypsum members with work of other trades.

B. Do not proceed with installation of prefabricated glass reinforced gypsum members until building is sufficiently enclosed and ambient conditions are adequately controlled to prevent moisture and weather deterioration of prefabricated glass reinforced gypsum members. A uniform temperature of at least 60°F. shall be maintained before, during and after installation of prefabricated glass reinforced gypsum members.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide prefabricated glass fiber reinforced gypsum column covers as manufactured by one of the following:
   Casting Designs, Inc.
   Custom Castings
   Stromberg Architectural Products Inc

2.2 MATERIALS

A. General: Provide glass fiber reinforced alpha gypsum, of required thickness and shapes. Include all required connections, reinforcements, anchors, and accessories.

B. Material characteristics (minimum values):

1.	Shell thickness	1/4"
2.	Glass Fiber	5-6% by weight
3.	Weight	2.0 lb. per square ft.
4.	Flexural strength (ASTM D790)	4,427 psi
5.	Tensile strength (ASTM D790)	1,611 psi
6.	Compressive strength	7,030 psi
7.	Density	115.7 lbs. per ft.
8.	Impact (ASTM D256)	11 ft. lbs./in.
9.	Flammability	Flame spread 0
		Smoke developed 0

ASTM E 84, Class 1

2.3 RELATED MATERIALS

A. Steel Shapes: ASTM A 36.

B. Galvanized Steel Shapes: 16 gage fabricated from zinc coated commercial quality carbon steel sheets with minimum of 0.20% copper content complying with ASTM A 653.

C. Anchors and Fasteners:
   1. Bolts: ASTM A 307.
   2. Self-tapping Metal Screws: Comply with Gypsum Association GA-216 of require sizes. Use Milcor TITE-LOK type fasteners for application to light-gage framing members.

D. Joint Treatment Materials:
   1. General: ASTM C 475; type recommended by the manufacturer for the application indicated.
   2. Joint Tape: Perforated type.
   3. Joint Compound: Ready-mixed vinyl-type for interior use. Provide 2 separate grades; one specifically for bedding tapes and filling depressions and one for topping and sanding.

2.4 FABRICATION

A. Molds: Fabricate molds for prefabricated glass reinforced gypsum members to required sizes and shapes with linings for smooth finished surfaces, without waves, warp, or distortions on any kind.

B. Mixing gypsum and placing glass fiber reinforcement: Mix gypsum with additives to provide gypsum of required materials characteristics. Coordinate placement of gypsum and glass fiber to provide reinforced gypsum members of required sizes, shapes, and finish texture, of adequate thickness and reinforced to be self-supporting. Finished exposed surfaces shall be smooth and free of warp, waves, buckles, cracks or other visible defects, ready for application of applied finishes. Bevel surfaces at joints to permit application of joint reinforcement (taping and bedding).

C. Curing: After placement of gypsum and glass fiber reinforcement in molds, and after gypsum has set and become hard, remove hardened gypsum members form molds and store for curing and aging, under proper conditions of temperature and moisture.

D. Identification: Mark each unit on unexposed side, in accordance with marks established on shop drawings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which prefabricated glass reinforced gypsum column covers are to be installed for conditions detrimental to execution of work.

3.2 INSTALLATION

A. General: Install prefabricated glass reinforced gypsum column covers in required locations, plumb, and square, in required planes with related surfaces, securely anchored in place.

B. Secure base of columns to floors with clip angles.

C. Spread adhesive over flanges of both sections of column covers and press covers together over structural columns.

D. Secure covers with straps located maximum of 60" apart and maximum of 24" form ends of column for 24 hours.

E. Remove straps. Tape and float seams, joints and fasteners, and sand smooth to exhibit one-piece construction ready for field painting.

3.3 ADJUST AND CLEAN

A. Remove and replace defective prefabricated glass reinforced gypsum column covers.

B. Clean exposed surfaces of gypsum column covers and adjacent surfaces soiled or damaged during the work.

C. Clean up all debris caused by the work, keeping premises clean and neat at all times.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal stud wall framing.
2. Furred wall framing.
3. Metal channel ceiling framing.
4. Gypsum board partitions, ceilings, and furrings
5. Finishing of panel joints.

B. Related Sections:
1. Section 06 16 56 - Air- and Water-Resistive Sheathing Board System
2. Section 05 40 00 - Cold-Formed Metal Framing: exterior wall studs.
3. Section 07 21 00 - Building Insulation: acoustical and thermal insulation.
4. Section 07 84 00 - Firestopping.
5. Section 09 30 13 - Ceramic Tiling: backer board at shower areas.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, SAMPLES. Submit materials list of items proposed to be provided, manufacturer's data indicating compliance with specified requirements, and manufacturer's recommended installation procedures.

B. Submit diagrams of proposed control joint and expansion joint layout prior to starting work.

1.3 QUALITY ASSURANCE

A. Tolerances for Drywall: Do not exceed a variation of 1/8" in 10'-0" and 1/16" in 5'-0" from plumb, level, and flat (all directions) and do not exceed 1/16" offset of planes at joints between panels. Shim panels as necessary to comply with tolerances.

B. Perform Work in accordance with ASTM C 840, GA-216, GA-223 and GA-600.

1.4 PROJECT CONDITIONS

A. Environmental Requirements: In cold weather, maintain the temperature of the building reasonably constant at no less than 55° F. during gypsum panel application and joint finishing. Provide adequate ventilation to carry off excess moisture.

1.5 DELIVERY, STORAGE, HANDLING

A. Deliver, store, handle, and protect products in conformance with manufacturer's instructions and in accordance with Section 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and Section 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Store inside building, on sleepers, and out of water.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gypsum Board: ASTM C 1396. Provide Type X fire-rated; 48"w x 5/8" thick by maximum permissible length gypsum board with tapered edges. Product/manufacturer; one of the following:

CertainTeed Type X; CertainTeed Gypsum

ToughRock Fireguard X Gypsum Board: G-P Gypsum Corp.

Fire-Shield Gypsum Wallboard; National Gypsum Co.

Sheetrock Brand Firecode X Gypsum Panel; USG Corporation

B. Water- and Mold-Resistant Gypsum Board: ASTM C 1396. Provide Type X, water and mold resistant gypsum board with tapered edges; 48"w x 5/8" thick by maximum permissible length.
1. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
2. Provide at substrate for ceramic tile in toilets, EWC alcoves, and other wet areas (except showers)
3. Product/manufacturer; one of the following:

M2Tech Type X; CertainTeed Gypsum

ToughRock Fireguard X Mold-Guard Gypsum Board: G-P Gypsum Corp.

Gold Bond XP Fire-Shield Gypsum Wallboard; National Gypsum Co.

Sheetrock Brand Mold Tough Firecode X Gypsum Panel; USG Corporation

C. Gypsum Tile Backer Board: Refer to Section 09 30 00 - TILING for gypsum tile backer board to be used:
1. As a substrate for ceramic tile walls at all shower areas
2. At accessible shower ceilings, unless cement plaster is indicated.

D. Sheathing Board System: Reference SECTION 06 16 56 - AIR- AND WATER-RESISTIVE SHEATHING BOARD SYSTEM.

E. Studs: ASTM C 645. Non-loadbearing channel type roll-formed from minimum 25 gauge electro- or hot-dipped galvanized steel.
1. Provide 20 gauge (33 Mil) studs at the following:
   a. Interior ceramic tile partitions.
   b. Interior plaster partitions.
   c. Abuse-Resistant gypsum board partitions.
   d. Impact-Resistant gypsum board partitions.
2. Provide 18 gauge studs, per SECTION 05 40 00 - COLD-FORMED METAL FRAMING, at all X-bracing and at interior partitions where indicated on drawings.

F. Slotted Top Track: Basis of design shall be MaxTrak (SLT) Slotted Deflection Track System, as manufactured by Clark Dietrich or approved equivalent.
1. 25 ga thick, to ASTM A653/A653M, Grade 33 with a minimum yield point of 33,000 psi, electro- or hot-dipped galvanized steel.
2. 2-1/2" down-standing legs with 1/4" wide by 1-1/2" high slots spaced at 1" on center.
3. Track width shall match stud size by manufacturer’s standard length.
4. Fasteners: ASTM C 1002, self-drilling, self-tapping screws.

G. Furring, Framing and Accessories: Provide in conformance with ASTM C 645, GA-216, and GA-600 and as follows:
1. Cold Rolled Channels: 3/4", 1-1/2" and 2" x 9/16", 16 gauge, steel channels prime painted.
2. Furring Channels: ASTM 645, 7/8" deep x 1-1/4" face, roll-formed from 25 gauge electro-galvanized steel and furnished with galvanized wire clips.
3. Resilient Furring: 1/2" deep x 2” x 1-1/4" screw flange, 25 gage, galvanized with one leg attached only, Style RC-1 PRO™ as manufactured by ClarkDietrich Building Systems.

H. Fasteners: ASTM C 514 for nails and C 1002 for screws as follows:

1. Inserts, clips, bolts, nails or other screws as recommended by wallboard manufacturer, of type and size to suit application and to rigidly secure materials in place.
2. Self-drilling, self-tapping bugle head screws for use with power drive tool.
3. Screws: Drywall Screws, Type S Bugle Head.
4. Metal framing to structure: Power driven screw fasteners to withstand 190 lb. single shear resistance and 200 lb. bearing force when drive through structural head or base and without exceeding allowable design stress in runner, fastener, or structural support.
5. Metal to metal: 3/8", Type S or S-12, pan head screws.
6. Gypsum board to sheet metal application: Type S Bugle Head screws.
7. Gypsum board to gypsum board application: Type G screws.

I. Adhesive: Utilize adhesive meeting requirements of GA-216 over metal framing.

J. Accessories:
1. Runners: ASTM C 645, channel type sections roll-formed from electro-galvanized steel with unhemmed edges. Same gauge as studs with which used.
2. Hangers: No. 8 gauge annealed, galvanized wire.
3. Tie Wire: No. 16 gauge annealed, galvanized wire.
4. Trim: Galvanized steel corner reinforcements, edge trim angles and casings; USG No. 200 series.
5. Reinforcing Tape: 2-3/16" minimum width, cross laminated, spark perforated fiber tape.
6. Joint Compound: Quick-drying, polyindurate-type, pre-fill material.
7. Joint Topping: Vinyl base all-purpose finishing material.
8. Acoustical Sealant: A one-part acrylic base sealant designed for use with drywall construction.
9. Edge Sealant: USG Sheetrock Brand W/R Sealant for use in high-moisture room areas.
10. Control Joints: Roll-formed zinc control joints with 1/4" slot (USG #093).

K. Column Rings: Provide prefabricated Reveal Column Rings at all round column locations within gypsum board ceilings. Reveal Column Rings as manufactured by Fry Reglet or Gordon.

L. Special Trim: Softforms reveals by Pitcon Softforms as detailed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Workmanship: The completed gypsum wallboard surfaces shall be smooth, level or plumb, and acceptable to the finish material applicators. All joint treatment on exposed wallboard shall be invisible after painting.

B. Ceiling Furring:
1. Install in accordance with ASTM C 754, GA-216, GA-223 and GA-600 and manufacturer's instructions.
2. Space ceiling hangers 48" o.c. along runner channels and within 6" of ends of channel runs. Wrap or saddle-tie hangers around the runner channels to prevent twisting.
   a. Under steel construction, wrap hangers around or clip or bolt hangers to a structural steel member (not steel deck).
   b. Under bar joists suspend hangers from top chord or from bottom chord at panel points only.
   c. Under ductwork, employ trapeze system of hangers to support ceiling. Do not suspend hangers from ducts, piping or conduit.
3. Erect runner channels at 48" o.c. maximum and locate a channel within 4" of each parallel wall. Level channels with hangers taut and do not make kinks or bends in the hangers as a means of leveling. At channel splices, overlap ends 12" with flanges interlocked; secure each end with tie wire.
4. Erect furring channels at 16" o.c. for 1/2" thick gypsum or 24" o.c. for 5/8" thick gypsum board and at right angles to runner channels or main support members; secure with clips or saddle-tie to supports with tie wire. Make end splices by nesting channels 8" and wire tying each end.
5. At light troffers or other openings that interrupt the runner or furring channels, install additional reinforcing to restore lateral stability of the grillage.
6. No part of the suspended grillage (main runners and cross furring) shall be permitted to come in contact with abutting masonry walls and partitions.

C. Wall Furring: For gypsum wallboard over masonry, space furring channels vertically at 24" o.c. maximum and attach with power driven anchors through alternate wing flanges (staggered), spaced 24" o.c. Make end splices with 8" nested laps anchored to wall with two fasteners in each wing. Where necessary, install furring with adjustable furring brackets and 1/2" x 3/4" steel channels to which the furring channels shall be clipped or tied.

D. Partitions:
   1. Follow recommendations of U.S. Gypsum Co., "Gypsum Construction Handbook".
   2. Install studding in accordance with ASTM C 754, GA-216, GA-223 and GA-600.
   3. Erect partitions with studs aligned to be plumb and true. Anchor studs top and bottom with runners, shoes and clips.
   4. Attach floor runners to concrete slabs using shielded screws or power driven fasteners. Locate fasteners at corners and at runner ends and spaced not to exceed 24" o.c.
   5. Under drywall ceilings, attach metal runner to ceiling and position studs to engage the ceiling runner. Elsewhere, extend studs above the ceiling and brace securely to the floor above or roof structure above with a continuous top runner and channel braces unless specifically detailed otherwise. Where studs extend more than 24" above finished ceiling line, provide either 5/8" gypsum board on both sides of studs or horizontal bracing at 16" o.c. attached with mechanical fasteners to both flanges of studs.
   6. For fire rated partitions and where specifically detailed or noted, extend studs full height to the floor or roof structure above.
   7. Space studs as shown and noted but not more than 16" o.c. Locate studs not more than 2" from abutting partitions and partition corners. Anchor studs to runner flanges with positive screw engagement where located at corners and at door frame jambs.
   8. At door frame jambs of doorways up to 4'-0" wide, double the studs or reinforce with 20 gauge steel studs. At jambs of doorways over 4'-0" wide, reinforce with two 20 gauge steel studs placed back to back. Fasten reinforcing studs to the anchor clips on each door frame with bolts or screws. Place horizontally over each frame a cut-to-length section of runner track; attach with screws to the adjacent vertical studs.
   9. In chase wall construction, set studs opposite each other with the flanges in the same direction and cross brace between the rows of studs with three 12" high pieces of gypsum board or three pieces of metal stud attached to each pair of studs at the quarter points with drive screws.
   10. Double the studs at vertical control joints in partitions.
   11. Brace partitions to top chord of the structure above with 20 ga. diagonal braces at 4'-0" o.c. minimum. Where floor to structure height exceeds 16'-0", in addition to extending and fastening studs to structure, add 20 ga. stud diagonal braces at 4'-0" o.c. minimum.

E. Slotted Top Track: Install slotted track in strict accordance with manufacturer's written instructions and recommendations.
   1. Secure studs to slotted top track with #8 wafer-head screws.
   2. Maintain minimum deflection gap of 0.65 inch between top of stud and top of slotted track.
   3. Limit vertical movement to 1 inch, plus or minus 1/2 inch.

F. Sealant Application: Caulk those gypsum drywall partitions which have sound attenuation blankets, serving as sound barriers.
   1. Apply sealant in two continuous beads underneath runners at the floor and ceiling and where runners are used at partition intersections with dissimilar wall construction.
   2. Fill with sealant the grooves around the edges of wallboard at the floor, ceiling, and intersections with dissimilar walls.
   3. Caulk fully the openings around all cut-outs at electrical boxes, heating ducts and the like.

G. Wallboard Application:
   1. Apply gypsum wallboard first to the ceilings and then to the partitions. Use maximum practical lengths to minimize end joints. Fit ends and edges closely but not forced together.
   2. For single-layer ceiling application, apply wallboard with the long dimension either parallel or at right angles to the framing members. All abutting ends and edges shall occur over framing members, except in horizontal application. Stagger end joints in adjacent rows.
   3. For single-layer wall application with a ceiling height of 8'-2" or less, use either the horizontal or the vertical application method. With a ceiling height over 8'-2" and for fire-rated partitions, use only the vertical application method without any exposed horizontal joints. Stagger the vertical joints on opposite sides of a partition. Extend wallboard full height to the floor or roof structure above where so detailed.
   4. Fasten wallboard firmly to studs and furring channels with power-driven drywall screws. Gypsum board shall extend to within 1/4" of floor line. Drive screw heads close without cutting the surface paper or fracturing the core. Maximum screw spacing shall be 12" o.c. for ceilings and 16" o.c. for partitions. For fire-rated partitions, maximum spacing shall be 12" o.c. Do not drive screws closer than 3/8" from any edge.
   5. For two-layer wall application, apply the base layer of wallboard vertically; attach with screws spaced 16" o.c. Apply the face layer vertically with joints offset 24" from base layer joints; attach with adhesive and 1-5/8" screws spaced 16" o.c.

6. Wallboard joints in single layer or in face layer of two layer applications shall not occur within 12" of the corners of door frame, window frames, and openings larger than 12" x 12", unless control joints are installed at the corners.
7. Accurately cut and fit abutting ends, edges and holes for pipes and electrical fixtures. Support the edges of gypsum wallboard at cutouts and openings.
8. Reinforce exposed external corners with metal corner reinforcement.
9. Where wallboard surfaces abut dissimilar intersecting surfaces such as metal and masonry, trim the meeting edge with a metal trim angle held approximately 1/4" away from the intersecting surface. Caulk the joint full with sealant; tool smooth.
10. After application, check all gypsum wallboard for loose fasteners; drive tight any found loose.

H. Control Joints:
1. Isolate gypsum wallboard surfaces with control joints where specifically detailed and where the following conditions exist:
   a. Partition or furring run exceeds 30 feet without a corner or a ceiling-height door frame.
   b. Ceiling dimensions exceed 50 feet in either direction.
   c. Construction changes within the plane of the partition.
   d. Each side of column furring within a partition run.
   e. Above each door jamb from head to top of partition.
   f. At each side of furr downs.
2. Locate control joints in partitions at less-than-ceiling-height door frames with control joints extending to the ceiling from both top corners.
3. Make joints with roll-formed zinc control joints (USG #093) with 1/4" slot.
   a. Do not install roll-formed joint behind ceramic tile. Provide a 1/4" wide gap in the substrate only.
   b. At acoustical partitions, seal behind the joints with acoustical sealant.
4. Back-block ceiling control joints with face panel strips laid over the joints.
5. At acoustical partitions, seal behind partition control joints with batt acoustical insulation stuffed between the doubled studs.

I. Edge Sealing: On wallboard partitions to be covered with ceramic tile, treat cut edges, holes, corner joints, and intermediate joints with edge sealant before installation of wallboard panels. Treat all fastener heads with edge sealant after installation. Caulking of openings through ceramic tile is specified in SECTION 09 30 13 - CERAMIC TILING.

J. Joint Treatment:
1. Finish the joints in exposed wallboard, wallboard which is to be covered with vinyl wall covering and carpet wall covering, and wallboard in sound partitions to deck. Joints in wall board to be covered with ceramic tile shall be filled but may be left unfinished.
2. Fill the V-grooves between boards with quick drying joint compound. Wipe joints clean of excess compound and allow to harden.
3. Apply a thin layer of joint topping to joints. Immediately embed tape reinforcement over joints, follow with a skim coat of compound.
4. Apply joint topping over the tape to fill flush with the board surface.
5. Apply joint topping over the fill coat and feather out smoothly beyond fill coat edge. Sand between coats as necessary to provide a smooth surface ready for painting.
6. Fill screw head depressions flush with three coats of compound.
7. Finish metal corner reinforcements and edge and control joint trim with two or three coats of joint compound, using edge of trim as a screed to secure a smooth, flat finish.

K. Special Finishes for Gypsum Board Surfaces:
1. Areas Designated with Custom Digital Vinyl Wallcovering (Graphics): Examine substrates and installation conditions to ensure surface conditions meet or exceed a Level 5 Finish per ASTM C840 and GA-214-Recommended Levels of Gypsum Board Finish. Recess nails and screws. Repair irregular tape joints, sand and remove dust.
2. Areas Designated with Wall Protection Panels: Examine substrates and installation conditions to ensure surface conditions meet or exceed a Level 5 finish, per ASTM C840 and GA-214-Recommended Levels of Gypsum Board Finish.
3. Permanent lighting should be installed and operational for inspection of these areas prior to application of wall finish.

3.2 TOLERANCES

A. Maximum variation from true flatness: 1/8" in 10 feet in any direction.

END OF SECTION

SECTION 09 21 19

GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Gypsum board shaft wall systems.

B. Related Sections:
   1. Section 09 21 16 - Gypsum Board Assemblies.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements, General: Provide gypsum board shaft wall systems complying with performance requirements specified, as demonstrated by pretesting manufacturer's corresponding stock systems.

B. Fire-Resistance Ratings: Provide materials and construction which are identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by Underwriters' Laboratories, Inc., including those incorporating elevator door and other framing.

C. Structural Performance Characteristics: Provide gypsum board shaft wall systems engineered to withstand the following lateral design loadings (air pressures), applied transiently and cyclically, for maximum heights of partitions required, within the following deflection limits, verified by pretesting for deflection characteristics:
   1. Lateral Loading: 5 psf.
   2. Deflection Limit: L/240.

D. Sound Attenuation Performance: Provide gypsum board shaft wall systems designed and pretested to achieve an STC rating of 39 for sound transmission class per ASTM E 90.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include data indicating compliance with fire resistance, structural performance, and acoustical performance requirements.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products for gypsum board shaft wall systems from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner bead, trim, track, and studs.

1.6 PROJECT CONDITIONS

A. Comply with requirements for environmental conditions, room temperatures and ventilation specified in SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide gypsum board shaft wall systems as manufactured by one of the following:
   G-P Gypsum Corp.
   National Gypsum Co.
   United States Gypsum Co.

2.2 MATERIALS

A. Steel Framing: ASTM C 645, I, C-H or double E stud shape with sectional properties computed to conform with AISI "Specification for Design of Cold-Formed Steel Structural Members."

B. Gypsum Shaftliner Board: ASTM C 1396, Type X, 1" thickness, liner panel or coreboard designed for shaft wall construction, with moisture-resistant paper facings.

C. Gypsum Wallboard: ASTM C 1396, Type X, 5/8" thickness, with tapered edges to receive finish joint treatment.

D. Gypsum Backing Board for Multi-Layer Applications: ASTM C 1396 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 1396, Type X, edge configuration as standard with manufacturer.

E. Trim Accessories: Provide cornerbeads, edge trim and control joints of material and, for edge trim, shapes specified in SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES and complying with ASTM C 1047 and gypsum board shaft wall manufacturer's recommendations.

F. Gypsum Wallboard Joint Treatment Materials: Provide materials complying with ASTM C 475, ASTM C 840, recommendations of gypsum board shaft wall manufacturer for the application indicated, and as specified in SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES.

G. Miscellaneous Materials: Provide auxiliary materials for gypsum board shaft wall systems of the type and grade recommended by the manufacturer of the system and as follows:
   1. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum boards.
   2. Gypsum Board Screws: ASTM C 1002.
   3. Runner Fasteners: Low-velocity tool-driven fasteners of type, size and materials required to withstand loading conditions imposed on shaft wall system without exceeding allowable design stress of runner, fastener or structural substrate in which anchor is embedded.
   4. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, gunnable synthetic rubber sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install gypsum board shaft wall systems to comply with performance and other requirements indicated as well as with manufacturer's installation instructions and the following:
   1. ASTM C 754 for installation of steel framing.
   2. SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES for application and finishing of gypsum wallboard.

B. Install supplementary framing, blocking and bracing to support gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported directly by regular framing of gypsum board shaft wall system.
   1. Support elevator hoistway door frames independently of shaft wall framing system, or reinforce system in accordance with system manufacturer's instructions.

C. At penetrations in shaft wall, maintain fire resistance rating of entire shaft wall assembly by installing supplementary fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

D. Isolate shaft wall system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

E. Seal gypsum board shaft walls at perimeter of each section which abuts other work and at joints and penetrations within each section. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; comply with manufacturer's instructions and ASTM C 919.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 30 00

TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Ceramic Tile.
2. Porcelain Tile.
3. Tile Trim and Accessories.
4. Marble and Engineered Thresholds.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry; wood blocking at windowsills.
2. Section 07 92 00 - Joint Sealants.
3. Section 09 21 16 - Gypsum Board Assemblies.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Submit manufacturer’s written product data for each tile type and accessory.

C. Samples: Submit tile samples of the same size scheduled for each particular type of tile required.

D. Certificate: Furnish one master grade certificate on ceramic tile executed prior to delivery of the tile to the site.

1.3 QUALITY ASSURANCE

A. Standard: Tile shall be Standard Grade complying with the requirements of ANSI A 137.1. Deliver tile to the project site in grade sealed containers.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained.

B. Do not install adhesives in a closed, unventilated environment.

C. Maintain 50°F. during installation of mortar materials.

1.5 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver to the project site one box for each type, color, pattern, and size of tile installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.

PART 2 - PRODUCTS

2.1 TILE

A. Manufacturers: Ceramic tile and trim as manufactured by **American Olean, Dal-Tile Corp., Interceramic, and Crossville Ceramics** shall set all standards in the areas of trim shapes availability, tile size, color, pattern, and texture.

B. Ceramic and Porcelain Tile: Reference “Material Finish Schedule” in drawings for manufacturer, product, color and finish of tile.

C. Trim Pieces:
   1. Provide factory made fitters and trim shapes required for a finished installation. Keep job-cut fitters and trim shapes to a minimum. Provide bullnose tile at horizontal and vertical tile edges.
   2. Marble Thresholds: Group A domestic marble with honed finish. Color shall be as scheduled.

D. Floor Tile Wet Dynamic Coefficient of Friction: Not less than 0.42, when tested in conformance with ANSI A137.1.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, domestic manufacture.

B. Dry-Set Mortar: ANSI A 118.1, factory sanded mortar mix.

C. Latex-Portland Cement: ANSI A 118.15, flexible mortar consisting of cement-based mix and latex additive.

D. Adhesive: ANSI A 136.1, Type I, prepared organic adhesive.

E. Grout:
   1. Floor:
      a. ANSI A118.7, latex modified dry-set High Performance Cement Grout or commercial waterproof cement grout. Provide Ultracolor Plus FA as manufactured by MAPEI or approved equivalent by Custom Building Products or Laticrete. Color(s) shall be selected by Architect.
      b. ANSI A118.3; epoxy grout at kitchen, restrooms, and associated areas. Provide Kerapoxy CQ as manufactured by MAPEI or approved equivalent by Custom Building Products or Laticrete. Color(s) as selected by Architect.
   2. Walls: Modified acrylic, premixed Mastic Grout or dry-set grout complying with ANSI A118.7, color(s) as selected by Architect from Custom Building Products, Laticrete, Mapei or approved equal. If Contractor elects to provide dry-set grout, the installation shall be damp cured.

F. Lime: ASTM C 207, Type S, hydrated lime.

G. Sand: ASTM C 144, clean, masonry sand.

H. Water: Clean and potable.

I. Reinforcement: 1-1/2" x 17 gage galvanized woven steel wire fabric or 2 x 2 x 16/16 gage galvanized welded steel wire fabric.

2.3 SETTING BED MORTAR

A. Mix one part Portland cement and 4 parts damp sand, by volume. Hydrated lime may be added for plasticity in an amount not to exceed 1/10 part by volume.

B. Large Format and Heavy Tile Mortar: Provide Ultraflex LFT (medium bed mortar) as manufactured by MAPEI or approved equivalent.
   1. High content of dry polymer
   2. Nonsag and nonslump formula.
   3. Meets the highest ANSI rating of ANSI A118.15.

2.4 ADHESIVE/WATERPROOF MEMBRANE

A. Urethane Waterproofing and Tile-setting Adhesive: One-part liquid-applied urethane in a consistency suitable for trowel application and intended for use as both waterproofing and tile-setting adhesive in a two-step process. Product/manufacturer; one of the following:
   Hydroment Ultra-Set; Bostik
   Deck-Seal 1000; Southern Grouts & Mortars, Inc.

B. Reinforcing: Woven glass fiber scrim, 2" wide roll.

C. Large Format and Heavy Tile Waterproofing/Crack Isolation Membrane: Provide Mapelastic Aquadefense as manufactured by MAPEI or approved equivalent. Include Reinforcing fabric at change of planes and at drain areas.

2.5 SHOWER PAN

A. Shower Pan: Provide one of the following or approved equal 40-mil thick waterproofing sheet membranes at thickset tile applications:
   Composeal Blue Shower Pan Membrane; Compotite Corp.
   Chloraloy Shower Pan Liner; Noble Co. (Div. of Federal Process Corp.)

2.6 BACKER BOARD

A. Tile Backer Board: ASTM C 1178:
   1. Installation under ceramic tile on steel studs at shower locations.
   2. At accessible shower ceilings, unless cement plaster is indicated.
   3. Provide one of the following Products/Manufacturers:
      5/8" Diamondback GlasRoc Type X Tile Backer; CertainTeed Gypsum
      5/8" DensShield Fireguard Type X Tile Backer; Georgia-Pacific Corp
      5/8” Gold Bond Brand eXP Type X Tile Backer; National Gypsum Company
      5/8” Durock Brand Glass-Mat Type X Tile Backer; USG Corporation

2.7 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated.
   1. Contractor’s Option: Provide either tile manufacturer’s standard product as stated above, or the following product:
      a. Chlorinated Polyethylene Sheet: Non-plasticized elastomer with non-woven polyester laminated to both sides, nominal 0.030" thickness. Product/manufacturer; NobleSeal CIS; Noble Co.

2.8 ACCESSORIES

A. Metal Floor, Metal Corner and Top of Wainscot Trim: Provide protective edge trim by Schluter Systems L.P. or approved equivalent. Material and finish shall be as scheduled in “Material Finish Schedule” in drawings. Height as required to flush out with top of tile.

PART 3 - EXECUTION

3.1 PREPARATION

A. Sweep concrete slab surfaces clean and free of dirt and debris. Remove oil, grease, paint, and dried mortar.

B. Shower Pan Membrane Installation:
   1. Coat surface to receive membrane waterproofing with a minimum 3/16" thick coat of bond coat adhesive and in accordance with manufacturer’s recommendation and ANSI A 108.5.
   2. Provide PVC solvent cement welding of all seams and penetrations including drains.
   3. Provide factory fabricated pre-molded inside and outside corners.

C. Shower Wall Tile Base: At showers, install tile backer board. Apply with un-cut long edge at bottom of work. Fasten boards to steel stud framing with Type S bugle head drywall screws spaced 6" o.c. Space fasteners at least 3/8" from edge of board.

D. Concrete Slab-on-grade: Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions and recommendations to produce membrane bonded securely to substrate.

3.2 INSTALLATION

A. General Workmanship:
   1. Center and balance areas of tile, if possible.

2. Do not make an excessive amount of cuts. Usually, no cuts smaller than half size should be made. Make all cuts on the outer edges of the field. Fit tile carefully without marring or chipping the finish.
3. Smooth cut edges. Install tile without jagged or flaked edges.
4. Fit tile closely where edges will be covered by trim, escutcheons or other similar devices.
5. The splitting of tile is expressly prohibited except where no alternative is possible.
6. Maintain the heights of tilework in full courses to the nearest obtainable dimension where heights, given in feet and inches, are not required to fill vertical spaces exactly.
7. Make corners of all tile flush and level with corners of adjacent tile, with due allowance to tolerances for tile as specified in ANSI A137.1.
8. Keep all joint lines straight and even width, including miters.
9. Thoroughly back-up with thin-set bonding material all thin-set units, molded or shaped pieces; secure firmly in place.
10. Thoroughly back-up with mortar-bed mix thick-bed nosings, coves, curbing, gutters, flat tile and trimmers, molded or shaped pieces; secure firmly in place.
11. Bond coat mix shall not be used to back-up thick-bed trim and angles. Coat all thick-bed trim shapes with 1/32" to 1/16" of bond coat mix.
12. Finish floor and wall areas level and plumb with no variations exceeding 1/8" in 8' from the required plane.
13. Install accessories in tile work to be evenly spaced, properly centered with tile joints, and level, plumb and true to the correct projection. Install accessories at locations and heights designated.
14. Finished tile work shall be clean. Replace pitted, chipped, cracked and scratched tiles.

B. Setting Floor Tile - Conventional:
1. Set floor tile in straight joint pattern using Portland cement mortar in conformance with ANSI A 108.1.
2. Where tile is to be installed over waterproofing membrane, place wire reinforcing and mortar bed over the membrane. Lap reinforcing one full mesh and support so that it is completely embedded in the mortar bed.
3. Spread on a bonding coat of pure Portland cement paste not more than 15 minutes ahead of the mortar bed for quarry tile.
4. Place mortar bed, tamp firmly and screed to true planes and proper slopes. While still plastic, trowel a bond coat of cement paste over the mortar bed or dust a thin layer of dry cement over the mortar bed and work lightly until damp.
5. Set tile firmly on the mortar bed with close, uniform joints. Press and thoroughly beat in tile while the mortar bed is still plastic. Bring surfaces to true planes at the proper position of elevation. Slope tile down to floor drains. Make any adjustment of tile before initial set of the mortar takes place.

C. Setting Floor Tile - Thinset:
1. Set floor tile in straight joint pattern using dry-set cement mortar in conformance with ANSI A 108.5.
2. Mix and apply dry-set mortar in conformance with the manufacturer's recommendations. Cover surface evenly and comb with a notched trowel not more than 10 minutes before applying tile.
3. Set tile before initial set of the mortar has taken place. Press and beat tile firmly into place to establish proper and complete bond. Joints shall be close and uniform.

D. Setting Wall Tile:
1. Set base and wall tile over masonry in straight joint pattern using dry-set cement mortar in conformance with ANSI A 108.5.
2. Set base and wall tile of size less than 12" x 12" over gypsum wallboard in straight joint pattern using organic adhesive in conformance with TCA W242 and ANSI A 108.4.
3. Set base and wall tile of size more than 12" x 12" over gypsum wallboard in straight joint pattern using Latex Portland cement mortar in conformance with TCA W243 and ANSI A 108.5.
4. Surfaces to be tiled shall be dry, firm and proper for bond.
   a. Treat gypsum wallboard surfaces with a primer-sealer; caulk openings around pipes and fixtures with a non-hardening waterproof sealant.
   b. Apply leveling coat of sanded dry-set mortar over irregular surfaces if and as required to secure plumb, flat surfaces for the application of tile.
5. Mix and apply mortar and adhesive in conformance with best trade practice and the recommendations of the manufacturer of the materials used. Cover surfaces evenly, with no bare spots, and comb with a notched trowel within 10 minutes of applying tile.
6. Apply tile before skinning of the adhesive or mortar has taken place. Press and beat firmly into place to obtain at least 75 percent contact area of adhesive or mortar on the tile back.
7. If tile is face mounted, remove paper and glue before the adhesive or mortar is firmly set; adjust tiles that are out of line.
8. Provide control joints at all inside corners of wall tile areas. Install sealant in joint. Color as selected by Architect.

E. Setting Floor Tile - Adhesive/Waterproof Membrane:
1. Set floor tile in straight joint pattern using adhesive/waterproof membrane in conformance with ANSI A108.13 and waterproofing manufacturer's written instructions and recommendations.
2. All vertical penetrations and surfaces shall receive integral flashing made by coating both the vertical and horizontal surfaces with 30-50 mils of adhesive/waterproof membrane. Extend not less than 4" up and out from the juncture. Allow to set and then embed woven glass fiber scrim and re-coat with 50-75 mils of adhesive/waterproof membrane.
3. Apply adhesive/waterproof membrane using a serrated mason's trowel at a rate to achieve a thickness of not less than 1/16". Cove tile shall be placed first, followed by floor tile.
4. Set tile as the adhesive/waterproof membrane is spread. Press and beat tile firmly into place to establish proper and complete bond. Joints shall be close and uniform.

F. Grouting:
1. Force a maximum amount of grout into the joints.
2. Clean the joints of cushion-edge tile to depth of cushion. Fill joints of square-edge tile flush with face of tile.
3. Fill all gaps and skips. Mortar shall not show through grouted joints.
4. Finished grout shall be uniform in color, smooth, and without voids and low spots.
5. Grout joint width as recommended by tile manufacturer.
6. Damp cure Portland cement grout for at least 72 hours.

G. Wall Control Joints:
1. Provide a caulked control joint at same width as grout joints, minimum of 1/8”.
2. After tile work and grout are dry, clean the open control joint and roll-in foam rod stock to leave a joint depth of 1/4".
3. Fill the joint with primerless one-part acrylic polymeric sealant. Color shall be as selected by Architect.
4. Tool the sealant smooth.
5. Where tile on wallboard abuts tile on masonry, provide a 1/4" caulked control joint to separate the two areas.

H. Joints at Frames: Where ceramic tile abuts frame, provide a minimum 1/8" caulked expansion joint to separate tile from the frame.
1. After tile work and grout are dry, clean the joint at the frame.
2. Fill the joint with primerless one-part acrylic polymeric sealant.
3. Color shall be as selected by Architect.
4. Tool the sealant smooth.

I. Setting Marble Thresholds:
1. Set in a cement mortar bed mixed dry for tamping.
2. Press and tamp the marble into place until firmly bedded to the proper level, then lift out, parge the back with cement paste, butter the edges, and relay.
3. Clean surplus cement from the marble faces immediately.

J. Metal Floor Transition Trim:
1. Provide at transition of ceramic floor tile to lower flooring material (e.g. vinyl composition tile, exposed concrete, etc.) where no marble threshold is detailed.
2. Install as detailed on drawings.
3. Set transition trim prior to installing ceramic floor tile.
4. Set tile up tight to transition trim with a factory cushion edge. Trim shall be flush with top of ceramic tile.
5. After tile work and grout are dry, clean the joint between the trim and the tile.
6. Fill joint between trim and ceramic floor tile with sealant to match grout**.**

K. Metal Corner and Top of Wainscot Trim:
1. Provide at all outside corners and top of wainscot of ceramic wall tile.
2. Set metal corner trim prior to installing wall tile.
3. Set tile up to corner trim with a factory cushion edge. Provide a 1/8” joint between tile and trim. Trim shall be flush with faces of ceramic tile.
4. After tile work and grout are dry, clean the joint between the trim and the tile.
5. Fill joint with sealant to match grout**.**

3.3 CLEANING

A. When the work of other trades is completed, clean down tile and marble surfaces and leave in first class condition.

1. The use of wire brushes or acids is expressly prohibited.
2. Replace cracked, broken, and chipped tile with new units.
3. Correct uneven and stained joints.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Acoustical panels, accessories, and exposed suspension systems for ceilings.

1.2 SUBMITTALS

A. Samples: Submit in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, SAMPLES. Submit a 12" x 12" sample of each type of acoustic panel. Submit a 6" long sample of each component of each type of exposed suspension system.

1.3 QUALITY ASSURANCE

A. Erector Qualifications: This work shall be performed by an experienced erector approved by the acoustical material manufacturer.

B. Pre-ceiling conference:
1. Prior to start of ceiling grid installation, convene pre-ceiling conference at project site.
2. Attendance is required by Contractor, installer, and Architect.
3. Review specifications and drawings of ceiling installation and layout.

1.4 PROJECT CONDITIONS

A. Environmental Requirements:
1. Before acoustical work is started, all wet work such as concrete and plastering shall be completed and thoroughly dried out.
2. Acoustical ceiling shall not begin until building has been closed to the weather and suitable mechanical ventilation is supplied to maintain condition ranges of 60°F. to 85°F. at not more than 70% R.H. These conditions shall be maintained prior to, during, and after installation.
3. Acoustical panels shall be unpacked and allowed to stabilize for a period of 72 hours, in the environment as defined above, prior to installation.

B. Work Sequence:
1. Do not start acoustical work until mechanical and electrical work to be covered up has been inspected and approved.
2. Coordinate the related work of other trades involved in the ceiling installation.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store tile and panel cartons open at each end to stabilize moisture content.

1.6 WARRANTY

A. Acoustic Lay-in Panels: Submit manufacturer's standard 10-year warranty against sagging or warping (defined as greater than 1/8" measured in the panel center) from the date of installation.

1.7 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver maintenance materials to the project site, packaged with protective covering for storage and identified with appropriate labels. Furnish two boxes of full size acoustical ceiling units of each type installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. (ACT-01, ACT-02) Acoustical Lay-in Panels - Extra High NRC: ASTM E 1264, fiberglass panels, Class A (non-combustible) and having an NRC range of min. 0.90 or better.
   1. Size: 24" x 24" x 3/4"
   2. Color: Color(s) shall be as selected by Architect.
   3. Basis of Design: Armstrong No. Optima
   4. Acceptable Manufacturers
      Armstrong World Industries, Inc.
      CertainTeed Architectural
      USG Interiors, Inc.

B. Suspension System; Acoustic Lay-in Panels: Exposed type for panel ceilings as manufactured by the ceiling panel manufacturer or one of the following:
      Armstrong World Industries, Inc.
      CertainTeed Architectural
      Chicago Metallic Corp./Rockfon
      USG Interiors, Inc.
   1. Components shall be roll-formed from steel to meet ASTM C 635 and conform to the requirements for Intermediate duty structural classification. Exposed main tee runners shall be double web with capped face.
   2. At staggered ceiling tile/tee, provide single tee adapter clips/unopposed tee clips at off-module cross tee connections where the cross tees intersect a main tee and is not locked into place with another cross tee.
   3. Components shall be electro-zinc coated or hot-dip galvanized and exposed surfaces shall have white enamel finish.
   4. System shall be designed and sized to support the ceiling assembly with a maximum deflection of L/360 of the span.
   5. Color shall be white to match color of lay-in panels.
   6. Fire resistive systems shall be UL listed and labeled for a 1-hour time-design rating.

C. Hangers: 12 gage annealed and galvanized steel wire.

D. Hold-down Clips: UHDC Universal Hold Down Clip by Armstrong.

E. Column Rings: Provide prefabricated clamp rings to support suspended ceiling at all round column locations within acoustical ceilings. Column rings as manufactured by Fry Reglet or Gordon.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive acoustical treatment for conditions that will adversely affect the execution and quality of work. Designate any areas of potential interference between ceiling components and components of other trades. Do not start this work until unsatisfactory conditions are corrected.

3.2 CEILING INSTALLATION

A. General: Installation procedures shall meet or exceed the manufacturer's recommendations and ASTM C 636.
   1. Lay out each area so that the panel patterns are symmetrical, joints parallel to walls and borders generally equal in width.
   2. Coordinate the patterns with ceiling lights and grilles in conformance with the reflected ceiling plans and as directed.
   3. Verify types and sizes of light fixtures and grilles to be accommodated and arrange the work accordingly.

B. Suspension: Locate main and cross tee runners to form the indicated patterns.
   1. Use a laser leveling method to direct-suspend the main tees with hangers spaced not more than 48" o.c.
   2. Provide hangers within 6" of the corners of recessed lighting fixtures.

3. Under steel construction, wrap hangers around or clip or bolt hangers to a structural steel member (not steel deck).
4. Under bar joists, suspend hangers from top chord or from bottom chord at panel points only.
5. Under ductwork, employ trapeze system for hanging ceiling.
6. Do not suspend hangers from ducts, piping, conduit, or fireproofing membrane.
7. Use a laser beam system to level the main tee runners to within 1/8" in 12 ft. Level with hangers taut; do not make kinks or bends in hangers as a means of leveling.

C. Moldings: Install finish channel and angle moldings where ceilings abut walls, furrings and other intersecting vertical surfaces.
1. Moldings shall be in long lengths, secured to adjoining surfaces with at least two fasteners for each piece or more as may be required. Pull the molding snugly against the vertical surface without any gaps.
2. No molding length shall be less than 3 ft. except at short offsets.
3. Use prefabricated corner pieces where possible to eliminate field mitering.

D. Lay-in Panels: Install the acoustic panels in the exposed suspension system with bottom surfaces flush and in a true, level plane.
1. Hold-down clips are required at all vinyl covered gypsum panels for cleaning purposes.
2. Provide hold-down clips at lay-in panels within 6' of exterior exits.

E. Access: Provide access through acoustic panel ceilings with one or more access locations in each room to maintain a maximum spacing of 30 ft. between access panels.

3.3 TOLERANCES

A. Variation from flat and level surface: 1/8 inch in 10 ft.

B. Variation from plumb of grid members caused by eccentric loads: Two degrees (2°) maximum.

3.4 ADJUSTING AND PATCHING

A. Replace damaged members of exposed suspension system. Replace ceiling board and tile that is damaged, installed improperly, or shows visible signs of sagging.

3.5 CLEANING

A. After installation, clean soiled and discolored surfaces. Remove damaged units and replace with new.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 54 23

LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Linear metal ceiling system including perforated metal panel ceiling panels
2. Suspension systems for ceilings
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim
5. Interior installations

B. Related Sections:
1. Section 09 51 00 - Acoustical Ceilings.
2. Division 21 - Fire Suppression; Fire Sprinkler Heads And Trim.
3. Division 23 - Heating, Ventilating, And Air Conditioning (HVAC); HVAC Distribution Components.
4. Division 26 - Electrical

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For components with factory-applied color and other decorative finishes.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:
1. Linear Metal Ceiling: Set of 12-inch long Samples of each type and color and a 12-inch long spliced section.
2. Suspension System Members: 12-inch long Sample of each type, including main runner and 4 foot cross tees.
3. Exposed Molding and Trim: Set of 12-inch long Samples of each type, finish, and color.
4. End Cap and Panel Splice: Full size.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Linear pattern.
2. Joint pattern.
3. Ceiling suspension members.
4. Method of attaching hangers to building structure.
5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
6. Ceiling perimeter and penetrations through ceiling; trim and moldings.
7. Minimum Drawing Scale: 1/4 inch = 1 foot.
8. Maintenance Data: For finishes to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Subcontractor Qualifications: Installer shall have not less than three years of successful experience in the installation of linear metal ceiling systems on projects with requirements similar to requirements specified.

B. Source Limitations: Single-source responsibility: Provide acoustical panel units and grid components by a single manufacturer.

C. Surface-Burning Characteristics: Complying with ASTM E 1264 for Class A materials, as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Pre-installation Conference: Conduct conference at Project site, with Architect present. Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.5 PROJECT CONDITIONS

A. Interior Environmental Limitations: Do not install linear metal ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
1. Climate condition range of 60-degrees F to 85-degrees F and relative humidity of not more than 70 percent.

B. Mechanical Work: Ductwork above ceiling shall be complete, and permanent heating and cooling systems operating to climate conditions prior to installation of linear metal ceiling components.

C. Electrical Work: Installation of conduit and fire alarm components above ceiling shall be complete before installation of linear metal ceiling components.

D. Fire Protection Work: Fire protection lines and/or equipment occurring above ceiling shall be completed and tested before linear metal ceiling components are installed.

E. Exterior Work: For exterior applications, do not install linear metal ceilings until all exterior wall finish(s) are installed and final cleaning has occurred. Also, do not install until all fascia trim has been installed.

1.6 COORDINATION

A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Linear Metal Ceiling Components: Quantity of each panel, carrier, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

1.8 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
1. Acoustical Panels: Sagging and warping.
2. Grid System: Rusting and manufacturer’s defects.

B. Warranty Period:
1. Acoustical Metal panels: One (1) year from date of substantial completion.

2. Grid: One (1) year from date of substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide linear metal ceiling, custom trims and suspension system by the following:
USG
Armstrong World Industries, Inc.
Innovative Architectural Solutions

2.2 ALUMINUM PANS AND SUSPENSION SYSTEM FOR LINEAR METAL CEILING

A. (MP-01, MP-04) Aluminum Panels and Suspension System: Basis of Design shall be “Metalworks Linear 5492” 96 x 4 x 5/8" planks with acoustical fleece as manufactured by Armstrong World Industries, Inc.; Subject to compliance with requirements, the following will be acceptable:
USG; Paraline Linear Metal System
Innovative Architectural Solutions; Linea - Strip System
Armstrong World Industries; Metalworks Linear

B. Classification: Units complying with Fire Class – Class A, ASTM E 1264 for:
1. Perforated at Interior of the Building – Type M2

C. Panel Edge Detail: Manufacturer's standard edge detail.

D. End Cap, Finish of Exposed Portions: To match panel.

E. Suspension-System Main-Carrier Material: Hot-dip galvanized steel.

F. At Interior Locations: Provide 1” Glass Fiber Insulation. System shall have a NRC of .85.

G. (MP-02) Basis of Design shall be Arktura “Vapor Frequency” with Vertika aluminum ceiling panels backlit or architect approved equivalent.
1. Size: Refer to Drawings.
2. Openness in Plan: 10% openness; algorithmically generated pattern by manufacturer with varying sizes and shapes. Perforated pattern to be continuous across panelized system (panel edge to panel edge). Smooth inside cut faces.
3. NRC: minimum 0.55
4. Ceiling attachment method: Torsion Grid with torsion spring hinge, Class A rated or retrofit adapter kit from manufacturer compatible with 15/16” T-grid system.

H. (MP-03) Basis of Design shall be Arktura “Vapor Trail” custom aluminum ceiling panels with Vertika trim backlit or architect approved equivalent.
1. Size: Refer to Drawings.
2. Openness in Plan: 24% openness; custom algorithmically generated pattern by manufacturer with varying sizes and shapes. Perforated pattern to be continuous across panelized system (panel edge to panel edge). Smooth inside cut faces.
3. NRC: minimum 0.55
4. Ceiling attachment method: Torsion Grid with torsion spring hinge, Class A rated or retrofit adapter kit from manufacturer compatible with 15/16” T-grid system.

2.3 LINEAR METAL CEILING PANS

A. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.
1. Aluminum Sheet: Electrogalvanized steel – thickness 0.024” to 0.028”.
2. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton 0.70

B. Panel Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated to snap on and be securely retained on carriers without separate fasteners, and finished to comply with requirements indicated.

C. Panel Splices: Construction same as pans, in length per manufacturer; with finish to match panels.

D. End Caps: Metal matching panels; fabricated to fit and conceal exposed ends of panels.

E. Moldings and Trim: Provide manufacturer's standard moldings and trim for exposed members, and as indicated or required, for edges and penetrations of ceiling, around fixtures, at changes in ceiling height, and for other conditions; of same metal and finish as linear metal ceiling pans.

2.4 METAL SUSPENSION SYSTEMS

A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Suspension Systems: Provide systems complete with carriers, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:
1. 12 gauge hanger wire.

D. Carrier Splices: Same metal, profile, and finish as indicated for carriers.

E. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers at regular intervals and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated; and factory finished.

F. Edge Moldings and Trim: Provide exposed members as required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fascia at changes in ceiling height, and for other conditions; of metal and finish matching linear metal panels.

2.5 ACCESSORIES

A. Access Panels: If access must be provided at metal ceiling, provide manufacturer’s access door kit, including door hinge assembly, retainer clip, and retainer bar, assembled with ceiling panels and carrier sections into access doors of required size, permitting upward or downward opening. Confirm location(s) of access panels with Architect prior to installation or ceiling modification.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Exterior panels are to be finished on both sides.

2.7 ALUMINUM FINISHES

A. Color-Coated Finish: Manufacturer's paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

F. At exterior locations, do not install linear metal ceilings until all wall finishes have been installed and final cleaning has occurred. Also, do not install at exterior locations until all prefinished metal fascia, coping and gutters have been installed and before downspouts are attached.

3.4 CLEANING

A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Vinyl base and accessories.

1.2 SUBMITTALS

A. Samples: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit manufacturer's standard color samples of each accessory, full height or width by not less than 2" length.

1.3 DELIVERY

A. Deliver materials to the project site in unbroken containers and cartons bearing the manufacturer's labels.

B. Deliver resilient materials to an acclimatized building at least 48 hours for installation of rubber products.

1.4 PROJECT CONDITIONS

A. Environmental Requirements: Maintain the temperature inside the building reasonably constant at not less than 65°F. for 48 hours before installation, during installation, and for 48 hours after installation.

B. After installation, maintain temperatures within range recommended by manufacturer, but not less than 55°F. or more than 95°F.

1.5 WARRANTY

A. Rubber Base Warranty: Provide Standard 2-year manufacturers’ warranty that materials is free from manufacturing defects.

1.6 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver to the project site not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern, and size installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Base (RB-01): ASTM F1861, Type TV (vinyl, thermoplastic), Style Cove (with top-set toe), 1/8" thick, 4" high, color(s) as selected by Architect. Furnish base in manufacturer's continuous rolls. Outside corners shall be factory formed pre-molded units matching base in color and finish. Product/manufacturer; one of the following:
   Flexco
   Tarkett/Johnsonite
   Roppe Rubber Corp.
   NO SUBSTITUTIONS on Type TV (vinyl, thermoplastic)

B. Adhesive: Moisture-resistant type recommended by flooring manufacturer.

C. Cleaner: Neutral, chemical cleaner designed to be safe to use on any surface not damaged by water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive base and accessories for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Applying Base:
   1. Install coved base after the floor tile, mat, and carpet have been laid. Do not use less than manufacturer's continuous rolls, except where required for last piece in any one run of wall length.
   2. Apply base with adhesive covering 100% of the back surface, not just in spots. Apply adhesive with a notched trowel. Use headless brads in addition to adhesive where required. Use preformed outside corners and miter inside corners. Joints shall be tight.
   3. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

3.3 PROTECTION

A. Repair or replace damaged surfaces that are soiled or scarred in a manner acceptable to the Owner.

3.4 CLEANING

A. Clean in accordance with Section 01 77 00 – CLOSEOUT PROCEDURES.
   1. Remove excess adhesive and other foreign matter from base.
   2. Scrub base with cleaner in conformance with manufacturer's instructions and rinse.
   3. Replace defective or loose material.

END OF SECTION

SECTION 09 65 16

RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Resilient homogeneous vinyl sheet flooring and accessories.

B. Related Sections:
1. Section 03 30 00 - Cast in Place Concrete: Concrete finishing.
2. Section 09 65 13 - Resilient Base; rubber base.
3. Section 09 68 00 - Carpeting; edge strips.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Submit manufacturer's current printed product literature, specifications, installation instructions, and field reports.

C. Shop Drawings: Submit shop drawings to indicate materials, details, and accessories, including, but limited to, the following:
1. Submit a cut diagram indicating seam locations and roll direction. Use mitered seam layouts for comers when changing directions 180 degrees (e.g. when running material down corridors which bisect at a right angle), unless approved otherwise.

D. Samples: Submit manufacturer's standard color samples of tile, not less than 3" x 3", full thickness. Submit samples of each accessory, full height or width by not less than 2" length.

E. Concrete Slab Testing
1. Alkalinity and Adhesion Testing:
a. Submit result of pH tests.
b. Submit written documentation of acceptable pH levels of selected flooring manufacturer.
c. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.
d. Proceed with installation only after substrates pass testing.
2. Relative Humidity Probe Tests:
a. Submit results for in situ relative humidity probe tests.
b. Submit date and time measurements were made.
c. Submit locations and depth of probe holes.
d. Submit temperature and relative humidity in each probe hole.
e. Submit ambient air temperature.
f. Acceptable relative humidity is typically 75% or less. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have relative humidity percentage stated as acceptable by manufacturer.
g. Submit letter from flooring manufacturer stating that relative humidity is acceptable and manufacturer will issue warranty.
3. Anhydrous Calcium Chloride Testing
a. Submit time and date of placement and retrieval.
b. Submit ambient air temperature and humidity during test duration
c. Submit manufacturer’s instructions and relative technical data.
d. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
e. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.

F. Closeout Submittals: Submit the following:

1. Operation and maintenance data for installed products in accordance with Division 1 Closeout Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

B. Mock ups: Install at project site a job mock up using acceptable products and manufacturer approved installation methods, including concrete substrate testing.
   1. Maintenance: Maintain mock up during construction for workmanship comparison; remove and legally dispose of mock up when no longer required.
   2. Incorporation: Mock up may be incorporated into final construction upon Architect's approval.

C. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, manufacturer's warranty requirements, and installer qualifications.

1.4 DELIVERY

A. Deliver floor materials to the project site in unbroken containers and cartons bearing the manufacturer's labels.

B. Deliver resilient floor materials to an acclimatized building at least 36 hours prior to installation.

1.5 PROJECT CONDITIONS

A. Environmental Requirements: Maintain the temperature inside the building reasonably constant at not less than 65°F. for 48 hours before installation, during installation, and for 48 hours after installation.

B. After installation, maintain temperatures within range recommended by manufacturer, but not less than 55°F. or more than 80°F.

1.6 WARRANTY

A. Provide manufacturer's standard 10 Year Commercial Warranty.

1.7 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver to the project site not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. (RF-05) Sheet Flooring: Provide non-porous "iQ Optima" Vinyl Sheet Flooring with PUR reinforcement as manufactured by Tarkett or approved equivalent.
   1. Color as scheduled in the "Material Finish Schedule" in drawings.
   2. 6-1/12" wide, having a nominal total thickness of 0.080 in.
   3. The urethane-coated wear surface shall be composed of polyvinyl chloride resin, plasticizers, stabilizers, fillers, and pigments comprising a through-grain vinyl chip visual with pattern and color uniformly dispersed throughout the entire thickness. Embossed texture with slip resistant properties.
   4. Vinyl sheet flooring shall meet ASTM F-1913, "Standard Specification for Vinyl Sheet Floor Covering Without Backing", ASTM F1700 Standard Specification for Solid Vinyl Tile.and shall be asbestos-free.
   5. Where needed, color of Heat Welding Rods as selected by Architect to match flooring.
   6. Test Data:
      a. Flexibilty (ASTM F137): Passes
      b. 2. Chemical Resistance (ASTM F925): Passes

c. 3. Static Load Limit (ASTM F 970): Passes 250 psi
d. 4. Resistance to Heat (ASTM F1514): ΔE ≤ 8
e. 5. Resistance to Light (ASTM F1515): ΔE ≤ 8
f. 6. Residual Indentation (ASTM F1914): Passes
g. 7. Static Coefficient of Friction (ASTM D 2047): ≥ 0.5 SCOF
h. 8. Flamability (ASTM E648, Critical Radiant Flux): Class 1 (≥ 0.45 W/cm2)
i. 9. Limited Commercial Warranty: 20 years

2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, “moisture tolerant” Portland cement based or blended hydraulic cement-based formulation provided or approved by vinyl flooring manufacturer.

B. Accessories:
1. Adhesive: Moisture-resistant type recommended by flooring manufacturer.
2. Edge Strips: Provide two-piece vinyl Joining Moulding, No. 365 ‘T’ with No. 970 Track as manufactured by Burke Flooring, a Division of Burke Industries, (phone 800.669.7010 web site: www.burkeflooring.com). Color(s) as selected by Architect.
3. Cove former: Sized to suit application per manufacturer’s recommendations.
4. Cleaner: Neutral, chemical cleaner designed to be safe to use on any surface not damaged by water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive resilient flooring, base, and accessories for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

B. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

C. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

D. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

E. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.2 PREPARATION

A. Testing of concrete slabs
1. Anhydrous Calcium Chloride Testing
a. Conduct anhydrous calcium chloride testing per ASTM F1869, modified to include testing over concrete containing lightweight aggregate.
b. Environmental requirements of area to be tested are to match that of the finished floor covering. Doors, windows, roofing, etc. must be installed and the temperature of the building controlled to a finished building atmosphere. Ensure interior building climate is 75 degrees F ± 10 degrees F and 50% Relative Humidity ± 10% for 72 hours prior to, and throughout the duration of the tests.
c. The number of test kits required is determined by the square footage of areas scheduled to receive finish flooring. A minimum of three test kits are required in the first 1,000 sq. ft. a minimum of one test kit per each additional 1,000 sq. ft. with consideration given to separation of test areas. Time of exposure is a minimum of 60 hours and a maximum of 72 hours.
d. A prepackaged calcium chloride test kit is equipped with a sealed dish of anhydrous calcium chloride, a metering dome with gasket and instructions.

1) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
2) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
3) Unseal dish and expose test according to preprinted test kit instructions.
4) Allow 60 to 72 hours of exposure. Retrieve test dish re-seal and re-weigh according to instructions.
5) Provide a diagram of the building, with calculations, documenting each test location with its results in writing.

e. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours; however, submit written tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
f. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.

2. In Situ Relative Humidity Probe Test:
   a. Conduct in situ relative humidity probe testing per ASTM F2170.
   b. Concrete floor slabs shall be at the service temperature and the occupied air space above the slab shall be at the service temperature service relative humidity far at least 48 hours before taking relative humidity measurements in the concrete slab.
   c. Perform 3 tests for the first 1,000 sq/ft. and a minimum of 1 test for every 1,000 sq/ft. thereafter.
   d. For slabs on-grade and below-grade choose a testing location within 3 feet of each exterior wall.
   e. Drill probe holes 40% into depth of slab for slabs drying from the top only and 20% into the slab for slabs drying from top and bottom.
   f. Remove dust from hole using vacuum cleaner and allow 72 hours to achieve moisture equilibration within hole before taking relative humidity measurements.
   g. After inserting probe allow necessary amount of time for probe to reach temperature equilibrium before measuring relative humidity.
   h. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the slab in the vicinity of the hole.
   i. Proceed with installation only after substrates pass testing.
   j. Submit letter from flooring manufacturer stating that floor relative humidity percentage is acceptable and manufacturer will issue warranty.
3. Alkalinity and Adhesion Testing
   a. Conduct pH test per ASTM F710.
   b. Test for alkalinity prior to installation of flooring materials.
   c. pH levels shall not exceed the written recommendation of the flooring manufacturer and the adhesive manufacturer.
   d. A pH range of 5-9 is optimum, not to exceed 9 pH. Submit written acceptable pH levels of selected flooring manufacturer.
   e. Proceed with installation only after substrates pass testing.
   f. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.

B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Avoid organic solvents.

C. Perform subfloor preparation as recommended by flooring manufacturer to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.

D. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.3 INSTALLATION

A. Laying Flooring:
1. Install flooring in strict accordance with the latest edition of the flooring manufacturer's recommendations.
2. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
3. Scribe, cut, and fit or flash cove to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets. Within 0.5 m radius from floor drains, seams are not recommended.

4. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.
5. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at the seams in compliance with the manufacturer's recommendations.
6. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.
7. Prepare all seams shall be heat welded. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.
8. Where safety flooring is coved up wall surfaces and other abutments, installation shall be in accordance with safety flooring installation practices.
9. Prior to sealing in the corner, make sure that the PUR reinforcement is completely removed from the surface.
10. Finish all edges per manufacturer’s instructions.

3.4 CLEANING

A. Clean in accordance with Section 01 74 13 - CLEANING.
   1. Remove excess adhesive and other foreign matter from tile flooring and base.
   2. Scrub floor with cleaner in conformance with manufacturer's instructions and rinse.
   3. Replace defective or loose material.

3.5 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Repair or replace damaged surfaces that are soiled or scarred in a manner acceptable to the Owner.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 66 23.16

EPOXY-RESIN TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Synthetic terrazzo flooring.

B. Related Sections:
1. Section 03 30 00 - Cast-in-Place Concrete.
2. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. Samples
1. Submit samples consisting of one 12" x 12" samples of specified mixture with colors as selected by Architect, with saw cut to permit breaking into 6" x 12" pieces. If required by Architect, provide additional samples with slight variation in color and/or proportion of granite chip mixture.
2. One piece of approved sample will be retained by Architect for comparison with finished work.
3. Submit sample of divider strip showing finish.

B. Shop Drawings: Submittal to include terrazzo installation requirements. Include plans, sections, component details, and relationship to other work. Show layout of the following:
1. Divider strips.
2. Control-joint strips.
3. Accessory strips.
4. Abrasive strips.
5. Stair treads, risers, and landings.
6. Precast terrazzo jointing and edge configurations.
7. Terrazzo patterns.

C. Product Data:
1. Submit product literature for divider and control joint strips and expansion joints.
2. Submittal shall include manufacturer's maintenance recommendations. Include recommendations for proper neutral cleaner and sealers for use on epoxy terrazzo flooring.

D. Concrete Slab Testing
1. Alkalinity and Adhesion Testing:
a. Submit result of pH tests.
b. Submit written documentation of acceptable pH levels of selected flooring manufacturer.
c. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.
d. Proceed with installation only after substrates pass testing.
2. Relative Humidity Probe Tests:
a. Submit results for in situ relative humidity probe tests.
b. Submit date and time measurements were made.
c. Submit locations and depth of probe holes.
d. Submit temperature and relative humidity in each probe hole.
e. Submit ambient air temperature.
f. Acceptable relative humidity is typically 75% or less. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have relative humidity percentage stated as acceptable by manufacturer.
g. Submit letter from flooring manufacturer stating that relative humidity is acceptable and manufacturer will issue warranty.
3. Anhydrous Calcium Chloride Testing
a. Submit time and date of placement and retrieval.
b. Submit ambient air temperature and humidity during test duration
c. Submit manufacturer’s instructions and relative technical data.

d. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
e. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.

1.3 QUALITY ASSURANCE

A. Acceptable Supplier: Materials furnished shall meet The National Terrazzo and Mosaic Association (NTMA) Guide Specifications.

B. Installer Qualifications: The applicator performing this work shall be licensed/certified by the manufacturer of the flooring system, and both shall share jointly the responsibility for the flooring performance as specified. Submit written declaration of joint responsibility and proof of previous satisfactory performance by the applicator using this flooring system.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups for terrazzo including accessories.
a. Size: Minimum 100 sq. ft. of typical poured-in-place flooring and base condition for each color and pattern in locations directed by Architect.
b. Include base.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.4 PROJECT CONDITIONS

A. Environmental Requirements: Building areas where flooring are to be installed shall be heated to maintain surface and ambient temperatures at not less than 50°F during application and until the flooring has cured. Proper ventilation shall be maintained during application and curing.

B. Protection: Protect adjacent surfaces from damage resulting from this work. If necessary, mask or cover adjacent surfaces, fixtures, equipment and the like by suitable means.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Epoxy Terrazzo (TZ-01, TZ-02): Product/manufacturer; one of the following:
Terrazzo 1100; General Polymers Corp.
Terra-Res; National Terrazzo Tile and Marble, Inc.
MasterPiece ETS; Polymerica Inc.
Terroxy Resin Systems Epoxy Matrix; Terrazzo & Marble Supply Co.

2.2 MATERIALS

A. Full Coverage Flexible Membrane: Provide Terroxy® Iso-Crack or approved equal.

B. Matrix: Two-part 100% solids thermosetting epoxy resin.

C. Aggregate: Hard, washed domestic granite having a minimum of flats and flakes. All chips size 0 as per NTMA grading standards. Architect shall select colors from manufacturer's full color range.

D. Primer: Synthetic resin compound recommended by the manufacturer of the flooring system for the existing substrates.

E. Thin-Set Terrazzo Finishing Grout: Thin-set terrazzo resin manufacturer's resin-based finishing grout.

F. Colors shall be as selected by Architect. Provide custom design as indicated on the drawings.

G. Strips: Stop and divider strips of zinc alloy.

H. Colorants: Non-fading colorants. Architect shall select from manufacturer's full range for new flooring.

I. Cleaner: Chemically neutral cleaner with pH factor between 7 and 12 that is biodegradable, phosphate free, and recommended by cleaner manufacturer for use on epoxy terrazzo.

J. Epoxy Terrazzo Sealer: Slip-resistant (min. 0.5) and stain-resistant water based surface sealer that is chemically neutral with pH factor between 7 and 12, does not affect color or physical properties of terrazzo type indicated, is recommended by sealer manufacturer for this use, and complies with NTMA Guide Specification for epoxy terrazzo.

2.3 PHYSICAL PROPERTIES

A. Furnish Architect with a pre-qualification report from an approved Testing Laboratory using the test methods and achieving results on cured test samples equal to or better than those listed hereinafter:

PROPERTY	TEST METHOD	RESULTS
Compressive Strength	ASTM D 695	10,000 psi min.
Tensile Strength	ASTM D 638	3,000 psi
Tensile Elongation	ASTM D 638	5% min.
Impact Strength	Fall ball, 2 lbs. 12" x 12" x ¼"	16 ft. lbs. without chipping, cracking or indentation
Bond Strength	ASTM D 790	300 psi - 100% concrete failure
Flexural Strength, Cured Binder	ASTM D 790	10,000 psi
Flammability	ASTM D 635	Self extinguishing, Extent of burning; 0.25 inches
Resistance to Elevated Temperature	MIL D 3134-F paragraph 4.7.5	No measurable flow
Thermal Coefficient of Linear Expansion	ASTM D 696	25 x 10-6 inch per inch per degree Fahrenheit Temp. range-12°F to 140°F
Linear Shrinkage	ERF-64	0.001"
Hardness	ASTM D 2240	60-85
Fading Resistance	ASTM E 188	No discoloration at 48 hrs.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Concrete Slabs:
   1. Provide sound concrete surface free of laitance, glaze, efflorescence, curing compounds, form release agents, dust, dirt, grease, oil and other contaminants incompatible with terrazzo.
      a. Prepare concrete mechanically by shot blasting. Surface preparation results should achieve a CSP3-CSP5 profile according to International Concrete Repair Institute Guideline No. 03732.
      b. Repair or level damaged and deteriorated concrete.
      c. Repair cracks and non-expansion joints greater than 1/16” wide.

B. Verify that concrete substrates are visibly dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

C. Testing of concrete slabs
   1. Anhydrous Calcium Chloride Testing
      a. Conduct anhydrous calcium chloride testing per ASTM F1869, modified to include testing over concrete containing lightweight aggregate.
      b. Environmental requirements of area to be tested are to match that of the finished floor covering. Doors, windows, roofing, etc. must be installed and the temperature of the building controlled to a finished building atmosphere. Ensure interior building climate is 75 degrees F ± 10 degrees F and 50% Relative Humidity ± 10% for 72 hours prior to, and throughout the duration of the tests.
      c. The number of test kits required is determined by the square footage of areas scheduled to receive finish flooring. A minimum of three test kits are required in the first 1,000 sq. ft. a minimum of one test kit per each additional 1,000 sq. ft. with consideration given to separation of test areas. Time of exposure is a minimum of 60 hours and a maximum of 72 hours.
      d. A prepackaged calcium chloride test kit is equipped with a sealed dish of anhydrous calcium chloride, a metering dome with gasket and instructions.
         1) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
         2) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
         3) Unseal dish and expose test according to preprinted test kit instructions.
         4) Allow 60 to 72 hours of exposure. Retrieve test dish re-seal and re-weigh according to instructions.
         5) Provide a diagram of the building, with calculations, documenting each test location with its results in writing.
      e. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours; however, submit written tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
      f. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.
   2. In Situ Relative Humidity Probe Test:
      a. Conduct in situ relative humidity probe testing per ASTM F2170.
      b. Concrete floor slabs shall be at the service temperature and the occupied air space above the slab shall be at the service temperature service relative humidity far at least 48 hours before taking relative humidity measurements in the concrete slab.
      c. Perform 3 tests for the first 1,000 sq/ft. and a minimum of 1 test for every 1,000 sq/ft. thereafter.
      d. For slabs on-grade and below-grade choose a testing location within 3 feet of each exterior wall.
      e. Drill probe holes 40% into depth of slab for slabs drying from the top only and 20% into the slab for slabs drying from top and bottom.
      f. Remove dust from hole using vacuum cleaner and allow 72 hours to achieve moisture equilibration within hole before taking relative humidity measurements.
      g. After inserting probe allow necessary amount of time for probe to reach temperature equilibrium before measuring relative humidity.
      h. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the slab in the vicinity of the hole.
      i. Proceed with installation only after substrates pass testing.
      j. Submit letter from flooring manufacturer stating that floor relative humidity percentage is acceptable and manufacturer will issue warranty.
   3. Alkalinity and Adhesion Testing
      a. Conduct pH test per ASTM F710.
      b. Test for alkalinity prior to installation of flooring materials.
      c. pH levels shall not exceed the written recommendation of the flooring manufacturer and the adhesive manufacturer.
      d. A pH range of 5-9 is optimum, not to exceed 9 pH. Submit written acceptable pH levels of selected flooring manufacturer.
      e. Proceed with installation only after substrates pass testing.
      f. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable, and manufacturer will issue warranty.

D. Priming: When surfaces are clean and completely dry, apply a thin coat of primer with roller, brush, squeegee or trowel. Do not spray.

3.2 APPLICATION

A. General: Overall thickness of synthetic terrazzo floor shall be ¼". Installation shall be by trained mechanics and performed in conformance with the printed instructions issued by the system manufacturer.

B. Divider and Control-Joint Strips:
   1. Locate divider strips in locations indicated on shop drawings.
   2. Install control-joint strips back to back and directly above concrete-slab control joints and in locations indicated on shop drawings.
   3. Install control-joint strips with 1/4-inch gap between strips, and install sealant in gap.
   4. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.

C. Laying Topping:
   1. Mix the two part epoxy material in the mechanical mixer. Add granite chips and continue mixing only until all chips are wet.
   2. Spread, screed and trowel epoxy-chip compound over area to a uniform thickness that will net ¼" after grinding.
   3. Seed trowelled surface with additional chips in same proportions as contained in terrazzo mix.
   4. Install curing material per manufacturer's recommendations.
   5. Allow topping to cure overnight without applying any type of curing agent.

D. Grinding, Grouting and Surfacing:
   1. Grind first with a 24 grit or finer carborundum stone, following with a 100 grit or finer stone. Wash surface with water, clean residue from voids and remove excess water.
   2. Hand apply an epoxy grout using an identical color as used in topping, working grout into voids. When grout begins to set, rub to consolidate into voids and remove excess.
   3. Cure grout.
   4. Fine Grinding:
      a. Grind surface with a 120 grit carborundum stone until all grout is removed from surface.
      b. Upon completion, terrazzo shall show a minimum of 70% of marble chips.

3.3 CLEANING AND PROTECTION

A. Cleaning and Sealing: Clean surface with cleaner compound and rinse with water. When surface is dry, apply sealer according to manufacturer's instructions and buff.

B. Protect the finished floor after final grinding and sealer has been applied to the terrazzo surfaces.

C. Provide “Builder Board with Liquid Shield”, tape all seams with Seam Tape. Perimeter Tape not required. If perimeter tape is used, it shall be Painters Tape.”

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 67 23

RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Decorative epoxy-resin flooring consisting of colored quartz aggregate in an epoxy matrix.

B. Related Sections:
   1. Section 09 62 05 - Moisture Vapor Emission and Alkalinity Control.

1.2 SUBMITTALS

A. Product Data: For each type of product specified. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: Of each resinous flooring system required, 6 inches square, applied by Installer for this Project to a rigid backing, in color, texture, and finish indicated. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

D. Material Test Reports: From a qualified independent testing agency indicating and interpreting test results of the resinous flooring's reaction to chemicals and other reagents and substantiating compliance with requirements.

E. Material Certificates: In lieu of material test reports, when permitted by Architect, signed by manufacturers certifying that materials furnished comply with requirements.

F. Concrete Slab Testing
   1. Alkalinity and Adhesion Testing:
      a. Submit result of pH tests.
      b. Submit written documentation of acceptable pH levels of selected flooring manufacturer.
      c. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.
      d. Proceed with installation only after substrates pass testing.
   2. Relative Humidity Probe Tests:
      a. Submit results for in situ relative humidity probe tests.
      b. Submit date and time measurements were made.
      c. Submit locations and depth of probe holes.
      d. Submit temperature and relative humidity in each probe hole.
      e. Submit ambient air temperature.
      f. Acceptable relative humidity is typically 75% or less. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have relative humidity percentage stated as acceptable by manufacturer.
      g. Submit letter from flooring manufacturer stating that relative humidity is acceptable and manufacturer will issue warranty.
   3. Anhydrous Calcium Chloride Testing
      a. Submit time and date of placement and retrieval.
      b. Submit ambient air temperature and humidity during test duration
      c. Submit manufacturer's instructions and relative technical data.
      d. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
      e. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who has specialized in installing resinous flooring similar in material, design, and extent to that indicated for this Project and who is acceptable to resinous flooring manufacturer. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to install resinous flooring systems specified.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Field Samples: On floor area selected by Architect, provide full-thickness resinous flooring system samples that are at least 48 inches square to demonstrate texture, color, thickness, chemical resistance, cleanability, and other features of each resinous flooring system required. Simulate finished lighting conditions for review of in-place field samples.
   1. If field samples are unacceptable, make adjustments to comply with requirements and apply additional samples until field samples are approved.
   2. After field samples are approved, these surfaces will be used to evaluate resinous flooring.
   3. Obtain Architect's approval of field samples before applying resinous flooring.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work Include, but are not limited to:

   Dex O-Tex, Crossfield Products Corp. (phone 310.886.9100 web site: www.dexotex.com)
   Harris Specialty Chemicals, Inc. (phone 800.322.7825)
   Key Resin Company (phone 888.943.4532 web site: www.keyresin.com)
   Neogard, Division of Jones-Blair (phone 800.321.6588 web site: www.neogard.com)
   Palma Inc. (phone 800.336.7256 web site: www.palmainc.com)
   RBC Industries, Inc. (phone 888.722.3769 www.rbcepoxy.com/index2.htm)
   Sherwin-William (866-540-1299, https://industrial.sherwin-williams.com/na/us/en/resin-flooring.html)
   Silikal Resin Systems (phone 800.477.4545 we site: www.silikalresins.com)
   Stonhard (phone 800.257.7953 web site: www.stonhard.com)

   1. (PF-01) Color and Pattern: Integrally colored, random sized chips. Color selected by Architect from manufacturer's full range of colors and patterns produced for resinous flooring complying with requirements indicated.
   2. Total Thickness of Body Coat(s): As recommended by manufacturer for system compliance with requirements.
   3. System Thickness: Minimum 1/8 inch.
   4. Wearing Surface: Antislip.

5. Base: 4 inch high integral cove base.
6. Components: Provide manufacturer's standard components complying with requirements, unless otherwise indicated. Provide the following optional components where recommended by the manufacturer for intended uses and locations:
   a. Primer.
   b. Reinforcing membrane.
   c. Chemical-resistant sealing or finish coat(s).

B. Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to standard test methods indicated:
1. Compression Strength: 12,500 psi per ASTM C 579.
2. Tensile Strength: 2,600 psi per ASTM C 307.
3. Flexural Modulus of Elasticity: 4,500 psi per ASTM C 580.
4. Water Absorption: 0.04 percent maximum per ASTM D 570.
5. Indentation: 0.025 percent maximum per MIL-D-3134.
6. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
7. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch per MIL-D-3134.
8. Abrasion Resistance: 24 mg maximum weight loss per ASTM D 2047.
9. Flammability: Self-extinguishing per ASTM D 635.
10. Hardness: 75-80, Shore D per ASTM D 2240.
11. Bond Strength: 400 psi, 100 percent concrete failure per ACI 503R.

C. Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM D 543, Procedure A, for immersion in the following reagents for not less than 7 days:
1. Ammonium hydroxide, carbon tetrachloride, citric acid, dimethyl formamide, formaldehyde (3%), heavy-duty detergent, heptane, hydrogen peroxide (28%), lactic acid, oleic acid, phenol solution, sodium carbonate (20%), sodium chloride (10%), sodium hydroxide (60%), sodium hypochlorite, sulfuric acid (30%), urine.

2.2 MATERIALS

A. Resinous Flooring (PF-01): Resinous floor surfacing system consisting of primer; body coat(s) including resin, hardener, aggregates, and colorants, if any; and sealing or finish coat(s).
1. Reinforcing Membrane: Manufacturer's flexible resin recommended for crack isolation to help prevent substrate cracks from reflecting through resinous flooring.

B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

C. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrate according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral substrate for resinous flooring application.

B. Testing of concrete slabs
1. Anhydrous Calcium Chloride Testing
   a. Conduct anhydrous calcium chloride testing per ASTM F1869, modified to include testing over concrete containing lightweight aggregate.
   b. Environmental requirements of area to be tested are to match that of the finished floor covering. Doors, windows, roofing, etc. must be installed and the temperature of the building controlled to a finished building atmosphere. Ensure interior building climate is 75 degrees F ± 10 degrees F and 50% Relative Humidity ± 10% for 72 hours prior to, and throughout the duration of the tests.
   c. The number of test kits required is determined by the square footage of areas scheduled to receive finish flooring. A minimum of three test kits are required in the first 1,000 sq. ft. a minimum of one test kit per each additional 1,000 sq. ft. with consideration given to separation of test areas. Time of exposure is a minimum of 60 hours and a maximum of 72 hours.
   d. A prepackaged calcium chloride test kit is equipped with a sealed dish of anhydrous calcium chloride, a metering dome with gasket and instructions.

1) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
2) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
3) Unseal dish and expose test according to preprinted test kit instructions.
4) Allow 60 to 72 hours of exposure. Retrieve test dish re-seal and re-weigh according to instructions.
5) Provide a diagram of the building, with calculations, documenting each test location with its results in writing.

e. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours; however, submit written tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
f. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.

2. In Situ Relative Humidity Probe Test:
   a. Conduct in situ relative humidity probe testing per ASTM F2170.
   b. Concrete floor slabs shall be at the service temperature and the occupied air space above the slab shall be at the service temperature service relative humidity far at least 48 hours before taking relative humidity measurements in the concrete slab.
   c. Perform 3 tests for the first 1,000 sq/ft. and a minimum of 1 test for every 1,000 sq/ft. thereafter.
   d. For slabs on-grade and below-grade choose a testing location within 3 feet of each exterior wall.
   e. Drill probe holes 40% into depth of slab for slabs drying from the top only and 20% into the slab for slabs drying from top and bottom.
   f. Remove dust from hole using vacuum cleaner and allow 72 hours to achieve moisture equilibration within hole before taking relative humidity measurements.
   g. After inserting probe allow necessary amount of time for probe to reach temperature equilibrium before measuring relative humidity.
   h. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the slab in the vicinity of the hole.
   i. Proceed with installation only after substrates pass testing.
   j. Submit letter from flooring manufacturer stating that floor relative humidity percentage is acceptable and manufacturer will issue warranty.
3. Alkalinity and Adhesion Testing
   a. Conduct pH test per ASTM F710.
   b. Test for alkalinity prior to installation of flooring materials.
   c. pH levels shall not exceed the written recommendation of the flooring manufacturer and the adhesive manufacturer.
   d. A pH range of 5-9 is optimum, not to exceed 9 pH. Submit written acceptable pH levels of selected flooring manufacturer.
   e. Proceed with installation only after substrates pass testing.
   f. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.

C. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminates incompatible with resinous flooring.
   1. Comply with ASTM C 811 requirements, unless manufacturer’s written instructions are more stringent.
   2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer’s written recommendations.

D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer’s written instructions.

E. Use patching and fill material to fill holes and depressions in substrate according to manufacturer’s written instructions.

F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer’s written recommendations.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer’s written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
4. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks or entire substrate surface as recommended by manufacturer.

D. Apply self-leveling slurry body coat(s) in thickness indicated.

E. Broadcast aggregates and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Integral Cove Base: Apply cove base mix to wall surfaces adjacent floor applications unless otherwise indicated. Round internal and external corners. Install cove base according to manufacturer's written instructions and details including taping, mixing, priming, troweling, sanding, and topcoating of cove base.

G. Apply sealing or finish coat(s), including grout coat, if any, of type recommended by resinous flooring manufacturer to produce finish indicated. Apply in number of coats and at spreading rates recommended in writing by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any number of times during flooring application require material samples for testing for compliance with requirements.
1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified and sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's Product Data.
3. If test results show installed materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.4 CLEANING AND PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

B. Clean resinous flooring not more than 4 days before dates scheduled for inspections intended to establish date of substantial completion in each project area. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 68 00

CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Carpet, including the following:
   1. Surface preparation.
   2. Glue down carpeting on floor surfaces.
   3. Accessories, including edge strips.

B. Related Sections:
   Section 09 65 00 - Resilient Flooring: rubber base.

1.2 SUBMITTALS

A. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include manufacturer's installation instructions.

C. Concrete Slab Testing
   1. Alkalinity and Adhesion Testing:
      a. Submit result of pH tests.
      b. Submit written documentation of acceptable pH levels of selected flooring manufacturer.
      c. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.
      d. Proceed with installation only after substrates pass testing.
   2. Relative Humidity Probe Tests:
      a. Submit results for in situ relative humidity probe tests.
      b. Submit date and time measurements were made.
      c. Submit locations and depth of probe holes.
      d. Submit temperature and relative humidity in each probe hole.
      e. Submit ambient air temperature.
      f. Acceptable relative humidity is typically 75% or less. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have relative humidity percentage stated as acceptable by manufacturer.
      g. Submit letter from flooring manufacturer stating that relative humidity is acceptable and manufacturer will issue warranty.
   3. Anhydrous Calcium Chloride Testing
      a. Submit time and date of placement and retrieval.
      b. Submit ambient air temperature and humidity during test duration
      c. Submit manufacturer’s instructions and relative technical data.
      d. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours. Submit written documentation of tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
      e. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.

D. Samples for verification purposes in manufacturer’s standard size, showing full range of color, texture, and pattern variations expected. Secure samples from material to be used for the work. Submit the following:
   1. 12" square samples of each type of carpet material required.
   2. 12" long samples of each type of exposed edge striping and accessory item.

E. Seaming Diagrams: Submit to the Architect for review.
   1. Contractor shall be responsible for conformance with the drawings and specifications relative to the installation.
   2. Architect's review will cover the sizes of the pieces and location of seams, but not dimensions or quantities.
   3. All length seams and cross joints necessary to the layout of the carpet shall be shown on the seaming diagrams.

F. Maintenance Manual: Provide 2 copies of a printed maintenance manual, written by the carpet manufacturer's Technical Service Department delivered to the Owner at the project site. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in carpet manufacturing with 5 years minimum experience.

B. Installer Qualifications: An experienced installer with 3 years minimum documented experience in carpeting installations of similar scope.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Carpet shall be delivered to the project site in mill wrappings. Each roll shall have register number tags attached or register number stenciled on bale.

B. Store materials for 3 days prior to installation in the areas of installation to achieve temperature stability.

1.5 PROJECT CONDITIONS

A. Measurements: Dimensions supplied on the drawings are approximate. Contractor shall carefully check dimensions and other conditions affecting his work in the field and shall be responsible for proper installation.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Temperature and Humidity: Carpet must be installed when the indoor temperature is between 65°F. and 95°F. with a maximum relative humidity of 65%. If ambient temperatures are outside these parameters, the installation must not begin until the HVAC system is operational and these conditions are maintained at least 48 hours before, during, and 72 hours after completion.

B. Provide sufficient lighting.

1.7 WARRANTIES

A. Manufacturer's 25-year warranty, non-prorated, against product failure covering all costs including freight, labor, and material for the following:
   1. Edge Ravel - wet or dry.
   2. Back delamination, wet or dry.
   3. Loss of 20 lb. average tuft bind - wet or dry.
   4. Static protection - 3.0 KV when tested under the Standard Shuffle Test, 70 F - 20% RH
   5. Wear - No more than 10% face yarn loss.
   6. Adhesive failure.

B. Installation Warranty: 5-Year Warranty, non-prorated, against installation related failure covering all costs including freight, labor, and material.

1.8 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver to the project site not less than 12 sq. yds. of each type, color, and pattern of carpet, exclusive of materials required to properly complete installation. Furnish maintenance materials from same production run as materials installed. Package maintenance materials with protective covering, identified with appropriate labels. Other remnants, usable scraps, and overage in carpeting shall be packaged in appropriate wrapping, labeled, and delivered to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. (CPT-01) Carpet: Provide “Custom Corollary” with Powerbond Cushion RS as manufactured by Tarkett. Carpet shall meet the following minimum requirements, NO EXCEPTIONS:
   1. Color shall be as scheduled in “Material Finish Schedule” in drawings.
   2. Width: 6-foot broadloom.
   3. Surface Texture: Stratatec® Patterned Loop
   4. Yarn Weight: 20 oz. per sq. yard minimum.
   5. Gauge: 5/64 minimum.
   6. Stitch per Inch: 9.9
   7. Tuft Density: 126.7 tufts/sq in.
   8. Density: 7,059 Per cubic yd. minimum (per ASTM D-5848).
   9. Face Yarn: Dynex SD® Nylon (Permanent Stain Resistance)
   10. Stain Resistance: AATCC-175, must pass Acid Red 40 spot test with an 8 or better.
   11. Dye System: Solution dyed.
   12. Backing system must provide a 100% moisture barrier.
   13. Appearance Retention; one of the following:
      a. ASTM D-7330 Method for Assessment of Surface Appearance Change in Pile Yarn Floor Coverings (Hexapod Test): Minimum 3.0 rating for heavy traffic.
      b. ASTM D5417 Vetterman Drum Test for 22,000 cycles. A minimum rating of 3.0 using CRI TM-101 Reference Scale.

B. (CPT-02) Walk-off Carpet: Provide “Assertive Action #04837” with Powerbond Cushion RS backing as manufactured by Tandus. Carpet shall meet the following minimum requirements, NO EXCEPTIONS:
   1. Color shall be as as scheduled in the “Material Finish Schedule” in drawings.
   2. Width: 6-foot broadloom.
   3. Construction: Symtex®
   4. Yarn Content: TDX Nylon
   5. Dye Method: Solution Dyed
   6. Face Weight: 29 oz per sq. yd.
   7. Gauge: 1/10
   8. Stitches per Inch: 9.0 stitches per Inch.
   9. Pile Height Average: 0.187-inch
   10. Total Product Thickness: 0.353 Inch.

C. Substrate Filler: As recommended by adhesive and carpet manufacturer; compatible with substrate.

D. Adhesive: Moisture-resistant type as recommended by the carpet tile manufacturer.

E. Edge Strips: Provide two-piece vinyl Joining Moulding, No. 365 ‘T’ with No. 970 Track as manufactured by Burke Flooring, a Division of Burke Industries, (phone 800.669.7010 web site: www.burkeflooring.com). Color(s) as selected by Architect.

F. Miscellaneous Materials: Types of seam sealers, thread, and other accessory items recommended by the carpet manufacturer and installer for the conditions of installation and use.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before commencement of work the Contractor shall inspect the floors to receive carpet to determine the condition of those surfaces, and shall furnish and apply suitable primer and otherwise prepare floor surfaces in accordance with the carpet manufacturer's instruction.

3.2 PREPARATION

A. Delay installation until surrounding work, including painting, has been completed. Vacuum substrate immediately prior to carpet installation, and remove deleterious substances which would interfere with installation or be harmful to the work.

B. Ensure floors are level, with maximum surface variation of 1/4 inch in 10 feet noncumulative. Inspect subflooring for cracks, holes, abrasions, rough spots, ridges, or other conditions which will adversely affect execution and quality of work.

C. Ensure concrete floors are free from scaling and irregularities and exhibit neutrality relative to acidity and alkalinity.

D. Use an approved cementitious filler to patch cracks, small holes, and for leveling.

E. Notify Architect in writing of conditions which will prevent satisfactory completion of work. Do not proceed until such defects are entirely corrected. Application or installation of carpet shall constitute acceptance of sub- floors.

F. Relaxing/Conditioning Carpet: To minimize wrinkling and buckling, and to facilitate installation, carpet shall be unrolled and allowed to relax in the installation area for a minimum of 24 hours [72 hours (vinyl-back carpet)] at a temperature between 65°F. and 95°F. Carpet must be adequately protected from soil, dust, moisture and other contaminants.

G. Testing of concrete slabs
   1. Anhydrous Calcium Chloride Testing
      a. Conduct anhydrous calcium chloride testing per ASTM F1869, modified to include testing over concrete containing lightweight aggregate.
      b. Environmental requirements of area to be tested are to match that of the finished floor covering. Doors, windows, roofing, etc. must be installed and the temperature of the building controlled to a finished building atmosphere. Ensure interior building climate is 75 degrees F ± 10 degrees F and 50% Relative Humidity ± 10% for 72 hours prior to, and throughout the duration of the tests.
      c. The number of test kits required is determined by the square footage of areas scheduled to receive finish flooring. A minimum of three test kits are required in the first 1,000 sq. ft. a minimum of one test kit per each additional 1,000 sq. ft. with consideration given to separation of test areas. Time of exposure is a minimum of 60 hours and a maximum of 72 hours.
      d. A prepackaged calcium chloride test kit is equipped with a sealed dish of anhydrous calcium chloride, a metering dome with gasket and instructions.
         1) Clean substrate in area to be tested by removing dust solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation, or laitance, mold mildew and other foreign materials.
         2) Weigh the tape sealed dish on a gram scale with 1/10th gram gradation. Record start weight, date and time on dish's label and instruction document.
         3) Unseal dish and expose test according to preprinted test kit instructions.
         4) Allow 60 to 72 hours of exposure. Retrieve test dish re-seal and re-weigh according to instructions.
         5) Provide a diagram of the building, with calculations, documenting each test location with its results in writing.
      e. Acceptable moisture emission rates are typically 3 lbs. per 1000 sq. ft. or less, in 24 hours; however, submit written tolerances for selected flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate as stated by manufacturer.
      f. Submit letter from flooring manufacturer stating that floor moisture emission rates are acceptable and manufacturer will issue warranty.
   2. In Situ Relative Humidity Probe Test:
      a. Conduct in situ relative humidity probe testing per ASTM F2170.
      b. Concrete floor slabs shall be at the service temperature and the occupied air space above the slab shall be at the service temperature service relative humidity far at least 48 hours before taking relative humidity measurements in the concrete slab.
      c. Perform 3 tests for the first 1,000 sq/ft. and a minimum of 1 test for every 1,000 sq/ft. thereafter.
      d. For slabs on-grade and below-grade choose a testing location within 3 feet of each exterior wall.
      e. Drill probe holes 40% into depth of slab for slabs drying from the top only and 20% into the slab for slabs drying from top and bottom.
      f. Remove dust from hole using vacuum cleaner and allow 72 hours to achieve moisture equilibration within hole before taking relative humidity measurements.
      g. After inserting probe allow necessary amount of time for probe to reach temperature equilibrium before measuring relative humidity.
      h. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the slab in the vicinity of the hole.
      i. Proceed with installation only after substrates pass testing.
      j. Submit letter from flooring manufacturer stating that floor relative humidity percentage is acceptable and manufacturer will issue warranty.
   3. Alkalinity and Adhesion Testing
      a. Conduct pH test per ASTM F710.
      b. Test for alkalinity prior to installation of flooring materials.

c. pH levels shall not exceed the written recommendation of the flooring manufacturer and the adhesive manufacturer.
d. A pH range of 5-9 is optimum, not to exceed 9 pH. Submit written acceptable pH levels of selected flooring manufacturer.
e. Proceed with installation only after substrates pass testing.
f. Submit letter from flooring manufacturer stating that floor alkalinity is acceptable and manufacturer will issue warranty.

3.3 INSTALLATION

A. Install carpet using the direct cement method.
1. Comply with carpet manufacturer's written instruction and recommendations. Maintain direction of pattern and texture throughout the entire building. Do not seam weft to warp, except as directed by Architect.
2. Extend carpet under open-bottomed and raised-bottom obstructions, and under removable flanges of obstructions. Extend carpet into closets and alcoves of rooms indicated to be carpeted, unless another floor finish is indicated for such spaces. Extend carpet under movable furniture and equipment.
3. Install carpet wall to wall, using continuous lengths and as broad widths as possible to minimize the placement of seams in traffic lanes. Cut edges shall be trued and appropriately treated to form invisible and non-raveling joints where exposed.
4. Edges of carpet abutting vertical surfaces shall fit tight and meet against such materials. Where carpet edges are not concealed by thresholds or other materials use vinyl edge strips.
5. In corridors, run carpet length parallel to the corridor walls. At corridor intersections, carpet shall change direction.
6. Installed carpet shall be free of spots, dirt or soil, and shall be without tears, frayed or pulled tufts. Carpet surfaces shall be smooth and tight, without wrinkles and open seams.

B. Check matching of carpet before cutting and ensure there is no visible variation between dye lots.

C. Double-cut carpet seams, where required, in manner to allow proper seam and pattern match. Ensure cuts are straight and true and unfrayed.

D. Seams
1. Install in accordance with approved seam layout using a minimum of seams. Where possible and practical, locate seams in areas of least amount of traffic.
2. Do not use small carpet fill strips.
3. Do not place seams perpendicular to doors or entries.
4. Cross joints necessary due to layout of areas shall be at absolute minimum and shall be indicated on shop drawings.
5. Cross joins necessary due to length of rolls received shall be placed, in the cutting, to avoid occurrence at conspicuous locations, near doors or at pivot points, and shall be approved prior to seaming.
6. Join seams in recommended manner so as not to detract from the appearance of the carpet installation and decrease its life expectancy. Ensure seams are straight, not overlapped or peaked and free of gaps.
7. Chemically or mechanically weld seams with manufacturer’s recommended seam sealer as stated in installation instructions. Make sure the seams are fully sealed/welded.
8. Roll with appropriate roller for complete contact of hardback carpet with mill-applied adhesive to sub-floor.
9. When recommended by manufacturer, backing should be rolled according to manufacturer’s instructions to assure transfer of the adhesive between floor and carpet backing.
10. When required by the manufacturer’s warranty, the manufacturer’s recommended seam sealer must be applied to cut edges of carpet to prevent seam failure.

E. Vacuum clean substrate. Spread adhesive in quantity recommended by manufacturer after primer application to ensure proper adhesion over full area of installation. Apply only enough adhesive to permit proper adhesion of carpet before initial set.

F. Lay carpet on floors with the run of the pile in same direction of anticipated traffic. Lay carpet on stairs with run of the pile in opposite direction of anticipated traffic to avoid peeking of backing at nosing.

G. Do not change run of pile in any one room or from one room to next where continuous through a wall opening.

3.4 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

3.5 PROTECTION

A. Prohibit traffic from carpet areas for 24 hours after installation.

END OF SECTION

SECTION 09 72 16

VINYL-COATED FABRIC WALL COVERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Vinyl-coated fabric wall covering.

B. Related Sections:
1. Section 09 21 16 - Gypsum Board Assemblies: taping and bedding of gypsum board.
2. Section 10 11 16 - Markerboards and Tackboards: cork wall tack surface.

1.2 SUBMITTALS

A. Samples: Submit in accordance with Section 01 33 23 - Shop Drawings, Product Data, and Samples. Submit 6" square samples of each type of vinyl wall covering.

B. Certificate: The manufacturer of the proposed vinyl wall covering shall furnish to the Architect written certification that the material shipped to the project will meet the physical and performance requirements listed below. Certification from a dealer or distributor will not be acceptable.

C. Maintenance Instructions: Submit copies of the vinyl wall covering manufacturer's printed instructions for maintenance of the installed work.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Work shall be performed by a skilled applicator having at least five years' experience in the installation of vinyl wall covering.

B. Source Quality Control: Flame spread rating of the material shall be determined by ASTM E 84. Each roll of goods delivered to the project shall bear Underwriters' Laboratories labels.

1.4 MAINTENANCE

A. Extra Materials: Upon completion of work, deliver to project site not less than 6 linear yards of each type, color, and pattern of vinyl wall covering installed. Furnish maintenance materials from same production run as materials installed. Other remnants, usable scraps, and overage in wall covering shall be packaged in appropriate wrapping, labeled, and delivered to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Wall Covering: Basis of Design: Provide Koroseal Interior Products, FS CCC-W-408, Type II/Class A; supported vinyl material shall consist of a pigmented and mildew inhibited polyvinyl chloride fused to cotton fabric. Wall covering shall have a flame spread rating of 25 or less when tested in accordance with ASTM E 84.
1. Color shall be as scheduled in the “Material Finish Schedule” in drawings.

B. Adhesive: Vinyl paste as recommended by the wall covering manufacturer.

C. Substrate Filler: As recommended by adhesive and vinyl wall covering manufacturers; compatible with substrate.

D. Substrate Primer and Sealer: Type as recommended by vinyl wall covering manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive vinyl wall covering for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Clean surfaces to receive vinyl wall covering, including dirt, grease, oil, other contaminants. Surfaces shall be dry, smooth, and clean. Protrusions or low spots must be sanded or filled, as needed, to achieve a smooth surface.

B. Acclimatize wall covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

C. Remove electrical plates and covers, light fixture trims, and similar items.

3.3 INSTALLATION

A. Applying Wall Covering: Follow the manufacturer's printed instructions for cutting and installing vinyl wall covering.
   1. Use fabric panels in exact order as they are cut from rolls; use rolls in consecutive order. Apply paste to the fabric back using a roller or paste brush.
   2. Trim deeply textured patterns, or patterns on which strip must be matched, on the worktable. Use a metal straight edge and sharp blade.
   3. Handle smooth, non-match patterns by pasting strips on the wall, overlapping the edge and "double cutting" through both thicknesses. Use thin metal strip between wall and material when cutting to avoid gouging the wall.
   4. Use stiff-bristled brush or flexible broad knife to eliminate air pockets and to secure the wall covering to the wall surface.
   5. Fill in spaces above doors and similar areas in sequence from the roll.
   6. Remove excess adhesive from each seam as it is made. Use sponge dampened with warm water. Wipe seam clean with dry cloth towel.
   7. Examine each seam carefully when completed. Trim additional selvage where required to achieve a color and pattern match at seams.
   8. Install seams vertical and plumb at least 6" from outside corners and 6" from inside corners, unless a change of pattern or color exists at corner. No horizontal seams are permitted.
   9. Except on match patterns, hang panels by reversing alternate strips.
   10. The installed fabric shall be secure, smooth, and clean without wrinkles, gaps or overlaps.

3.4 CLEANING

A. Clean vinyl wall covering with mild soap powder dissolved in warm water, and remove excess adhesive at joints and on adjacent surfaces.

B. Replace vinyl wall covering that cannot be successfully cleaned or that is applied to defective substrate surfaces.

C. Reinstall electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09 72 21

SANITARY WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pre-finished fiberglass reinforced panels (FRP).

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, SAMPLES.

B. Samples: Submit sample of each type of panel.

C. Maintenance Instructions: Submit copies of the manufacturer's printed instructions for maintenance of the installed work.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing commercial pre-finished panels with 5 years documented experience.

B. Applicator Qualifications: Work shall be performed by a skilled applicator having at least five years experience in the installation of pre-finished panels.

C. Source Quality Control: Flame spread rating of the material shall be determined by ASTM E 84. Each roll of goods delivered to the project shall bear Underwriters' Laboratories labels.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable building code for flame spread/fuel contribution/smoke development ratings when tested to ANSI/ASTM E 84.

1.5 ENVIRONMENTAL CONDITIONS

A. Building should be fully enclosed prior to installation with sufficient heat and ventilation.

B. Room temperature during installation must be 70°F. or above.

C. Panels should be allowed to equalize to the moisture in the room environment prior to installation.

1.6 DELIVERY AND STORAGE

A. Materials should be stored lying flat, under cover and protected from the elements. Panels should be allowed to acclimate to the room conditions for 48 hours prior to installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Prefinished Panels
1. Provide FRP Panels as manufactured by Marlite or approved equivalent.
2. Finish: Color and finish as selected by Architect from manufacturer's full color and pattern range.

B. Moldings and Trim Pieces: Inside Corner, Division and End Cap moldings. Provide all moldings required for a complete installation.

C. Adhesive: Type and brand recommended by the panel manufacturer.

D. Sealant: Silicone sealant as recommended by the panel manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive panels for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

B. Verify that substrate surfaces are clean, dry, solid, straight, and free from drywall dust, bumps, projections, loose plaster, or paint.

C. Beginning of installation means acceptance of substrate.

3.2 INSTALLATION

A. Applying Panels: Follow the manufacturer's printed instructions for cutting and installing panels.
1. Moldings can be applied by coated lath nails and/or adhesive. If nails only are used, backing materials must have nail holding capabilities or nails must be long enough to penetrate into furring or framing.
2. All panel edges inside and outside corners are to finished with moldings appropriate to that purpose.
3. All molding channels and joints between the system and different materials will be sealed with silicone sealant.
4. Adhesive will be applied in strict accordance with the manufacturer's instructions and under conditions recommended as appropriate to the specific adhesive being used.
5. Do not make panel joints directly over drywall joints.
6. Do not fit panels too tightly in moldings. Allow at least ⅛" in all channels for panel expansion after installation is completed.

3.3 CLEANING

A. Clean panels with mild soap and water to remove excess adhesive/sealant at joints and on adjacent surfaces.

3.4 PROTECTION

A. Protect finished installation under provisions of Section 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

3.5 DEFECTS

A. Replace panels applied to defective substrate surfaces. Correct defects in completed installation.

END OF SECTION

SECTION 09 72 26

CUSTOM DIGITAL WALLCOVERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Custom digital wallcovering.

B. Related Sections:
1. Section 09 21 16 - Gypsum Board Assemblies; level 5 finish of gypsum board walls.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples:
1. Submit "mini-mural" of complete finished image printed on actual substrate specified.
2. Submit sample section, 12" x 12", of final image at 100% resolution printed on actual substrate specified.

C. Manufacturer's Data: For each type of digital wallcovering proposed for use on the project, submit complete description of each wallcovering, including: pattern, total weight, fabric backing, tensile strength, tear strength, and fire hazard classification.

1.3 QUALITY ASSURANCE

A. Imperfections such as engraving roller die marks, roller repeat marks or other features deemed not in conformance with the specified materials, will be cause for rejection.

B. Applicators Qualifications: Work of this section shall be performed by a firm regularly engaged in the installation of vinyl wallcoverings of the types and qualities specified.

1.4 PROJECT SITE CONDITIONS

A. Temperatures
1. Maintain substrate surface and ambient temperatures above 65°F., unless required otherwise by manufacturer's instructions.
2. Do not apply adhesive when substrate surface temperature or ambient temperature is below 65°F.
3. Maintain these conditions 72 hours before, during, and after installation of vinyl wallcovering.

B. Lighting: Provide not less than 80 foot-candles per square foot minimum, on the surfaces to receive wallcoverings.

C. Wall Condition
1. The wall surface should be clean, dry, structurally sound, and free of mildew, grease, dust, or other stains.
2. Room humidity should not exceed 90%.
3. Wall surfaces should be primed with a good quality wallcovering primer.

1.5 WARRANTY

A. Submit manufacturer's written five year warranty against manufacturing defects.
1. All wallcovering materials when adhered to a sound surface with the manufacturer's recommended procedures and adhesive, shall be warranted free of manufacturing defects for a period of 5 years from the date of Substantial Completion.
2. Assuming no deterioration in the subsurface, if such manufacturing defects are claimed in writing during the warranty period, and proper documentation is presented to the manufacturer with regard to date of sale, plus adhesive used and surface applied to, the manufacturer, as its option, will either replace the vinyl wallcovering or refund the purchase price.

3. The foregoing limited warranty is in lieu of all other warranties, expressed or implied, written or oral.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Custom Digital Wallcovering Basis of Design as provided by MDC Wallcoverings or approved equivalent.
DreamScape; Roysons Corp. (Suede, Smooth)
MDC Wallcoverings
Redsmith
Riot Creative Imaging
Thomas Printworks
1. Digital wallcovering shall be printed on 53"/54" vinyl wallcovering substrate using piezo drop-on-demand technology incorporating eight colors, CYMK and half density CYMK. Printed image shall be dried from both front and back using combinations of IR and platen heaters to prevent media distortion.

B. Vinyl Wallcovering Substrate: Supported vinyl material, consisting of a through-pigmented, mildew-inhibitorized polyvinyl chloride, adhered to cotton, cotton/blend fabric backing, or a cellulose polyester nonwoven backing. All materials shall be Cadmium and Mercury free, and shall conform to the CFFA-W-101-B, using test methods as outlined in FedSpec CCC-T-191b, except as otherwise specified.
1. Total Weight: minimum 13 ounces per square yard, 19.5 ounces per linear yard.
2. Backing Weight: minimum 2 ounces per square yard.
3. Fabric backing and content: cotton, cotton/blend fabric, or a cellulose polyester non-woven.
4. Adhesion of coating to fabric: 3 pounds per 1 inch strip (ASTM D751).
5. Tensile strength: 97 X 92 (W x F).
6. Tear strength: 55 X 40 (W x F).
7. Flame Spread (UL): 10 (ASTM E84) or UL 723.
Smoke Developed (UL): 25 (ASTM E84) or UL 723.
Tested on reinforced cement board.
8. Mildew Resistance: Zone inhibition rating of "0" on face, "1" on backing (ASTM G21).
9. Staphylococcus Resistance: 100 percent reduction within 24 hours.
1006 NYS Quantitative Bacteria Resistance
10. Contains bactericides and mildew inhibitors to protect the product from microbiological and mildew growth, consistent with 40 C.F. R. ß152.25.

C. Adhesive: Heavy Duty Clay or Heavy Duty Clear or brands approved as equals by the manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Contractor shall examine surface for any imperfections. Do not start installation until unsatisfactory conditions are corrected.

B. Install digital wallcovering in accordance with the manufacturer's written instructions using heavy-duty vinyl wallcovering adhesive recommended by the manufacturer (Wheat paste shall not be used).

C. Before cutting, lay out panels in numeric order and examine each panel for color consistency, accuracy and proper image dimension.

D. Install each panel in numerical sequence hanging first panel to a vertical line. Overlap subsequent panels to match crop lines and double cut on the wall. Selvage (excess trimmed edge) should be removed from the wall and the seam closed within one hour.

E. Re-inspect after the application each panel for variations in color or pattern that are considered to be excessive. Notify wallcovering distributor or manufacturer's representative and request an inspection, before any further wallcovering is installed.

F. The wallcovering shall be smoothed to the hanging surface, using a stiff bristled sweep brush or a flexible broad-knife to eliminate air bubbles.

G. Remove excess adhesive along finished seams immediately after each wallcovering strip is applied. Use clean warm water, a natural sponge and clean towels. Change water often to maintain water cleanliness.

3.2 CLEAN-UP COMPLETION

A. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the wallcovering installation. Leave areas in neat, clean and orderly condition.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: On-the-job painting and finishing of exterior and interior surfaces.
   1. Included: Paint and finish the following materials, fittings, and equipment items which are exposed-to-view.
      a. Iron, steel, and galvanized metal.
      b. Wood.
      c. Concrete masonry units.
      d. Interior concrete ceiling and beam surfaces.
      e. Gypsum board.
      f. Interior caulked joints.
      g. Portland cement plaster.
      h. Bare and insulation covered piping and ductwork, conduit, hangers, grilles and registers, and primed metal surfaces and factory-finished surfaces of mechanical and electrical equipment.
   2. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels, including the following:
      a. Factory-finished metal lockers and finished light fixtures.
      b. Architectural aluminum and stainless steel.
      c. Interior concrete floors and steps and all exterior concrete.
      d. Acoustic panel ceilings, unless noted on drawings.
      e. Pre-finished cabinets.
      f. Operating parts: Moving parts of operating mechanical and electrical equipment, such as: valve and damper operators, linkages, sensing devices, motor and fan shafts
      g. Labels: UL, FM, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
   3. Contractor shall examine the drawings for mechanical and electrical work, and all materials installed throughout the building which require painting shall be painted under this section of the specifications.

B. Related Sections:
   1. Section 05 12 00 - Structural Steel Framing: shop priming of structural steel.
   2. Section 05 21 00 - Steel Joists Framing: shop priming of steel joists.
   3. Section 05 50 00 - Metal Fabrications: shop priming of metal fabrications.

1.2 SYSTEM DESCRIPTION

A. For purposes of this painting specification, the following areas and spaces are not considered finished, occupied areas and there will be no painting therein except for doors and frames and as may be specifically scheduled in article paint schedule.
   1. Mechanical chases.
   2. Spaces above suspended ceilings.
   3. Underfloor crawl spaces.
   4. Elevator hoistways.

1.3 SUBMITTALS

A. Samples:
   1. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
   2. Submit two 8-1/2" x 11" samples of each paint color scheduled on the color schedule prepared by the Architect. Samples shall be on heavy cardboard and shall be made with the actual mixed paints to be used on the project.
   3. Samples for Initial Selection of each type of texture finish product.

B. Paint Schedule:
   1. If painting materials other than those specified are proposed for use, submit a complete schedule of the materials to be substituted.
   2. This schedule shall be in the same form as the paint schedule included in this section, and shall list materials by manufacturer, brand name, and type for each surface to be finished.

3. Provide data sheet for each paint type listed in schedule.

C. Federal law requires renovation firms (including sole proprietorships) to be certified and requires individuals to be trained in the use of lead-safe work practices. Contractors who perform renovation, repairs, and painting jobs shall:
   1. Provide a copy of your EPA lead training certificate.
   2. Show what lead-safe methods you will use to perform the job.
   3. Provide references from at least three recent jobs involving projects before 1978.
   4. Keep records to demonstrate that you and your workers have been trained in lead-safe work practices and that you follow lead-safe work practices on the job.

D. Close-out Schedule: Upon completion of work, furnish a full schedule of paint types and colors actually used and formulas for each to the Owner.

1.4 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with 3 years' experience.

B. Applicator: Company specializing in commercial painting and finishing with 2 years' experience.

C. Product Labels: Include manufacturer's name, type of paint, stock number, color and label analysis on label of containers.

D. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as final coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

E. V.O.C. (Volatile Organic Compound) Compliance: Products listed in the schedules and/or substitutes proposed for use by Contractor must be formulated to meet all applicable ordinances and regulations regarding maximum V.O.C. content. Utilize products which have been specially formulated to meet such requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in original containers with seals unbroken and labels intact.

B. Storage: Contractor shall designate a specific space at the project site for storing and mixing materials. Protect this space and repair all damage resulting from use. Do not store kerosene nor gasoline in this space. Remove oily rags at the end of each day's work.

1.6 PROJECT CONDITIONS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 65°F. for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Minimum application temperatures for latex paints: 45°F. for interiors; 50°F. for exterior; unless required otherwise by manufacturer's instructions.

C. Minimum application temperature for varnish and finishes: 65°F. for interior or exterior, unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft.-candles measured mid-height at substrate surface.

E. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified during application and drying periods of 24 hours between coats and 72 hours after final coat.

F. Protection: Provide sufficient drop cloths to fully protect adjacent finished work.

1.7 PRECAUTIONS

A. Do not store paints, oils, thinners and other flammable items inside the building. They shall be stored in approved containers when not in actual use during the painting job. The fire hazard shall be kept at a minimum.

B. Take precautions to protect the public and construction workers during the progress of the work.

C. Furnish a temporary fire extinguisher of suitable chemicals and capacity, located near flammable materials.

1.8 MAINTENANCE

A. Extra Materials: Upon completion of the work, deliver to project site 2 gallons of each type and color of paint applied to interior and exterior surfaces. Provide formula for custom match colors.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide paint as manufactured by one of the following:
Benjamin Moore & Co. (https://www.benjaminmoore.com)
PPG Paints (https://www.ppgpaints.com)
The Sherwin-Williams Co. (https://www.sherwin-williams.com)

B. Materials described are based on the specifications of the above listed manufacturers, and are given to designate the quality of materials required. Materials of best quality grade are representative of the standard of quality required. Materials not displaying manufacturer's identification as a first line, best-grade product will not be acceptable.

C. Colors: The Architect will prepare a color schedule. Reference “Material Finish Schedule” in drawings. Regardless of which brand of paint is selected for use the Contractor shall intermix and blend as required to obtain an exact match to each color on the color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report to Architect any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum wallboard: 12 percent.
2. Interior located wood: 15 percent, measured in accordance with ASTM D 4442.
3. Concrete: 12 percent.
4. Masonry: 12 percent.
5. Plaster: 12 percent

D. Test shop-applied primers for compatibility with subsequent cover materials.

E. Perform the following Test procedure prior to painting. This will determine if Passivators exist on galvanized metal. This procedure is not necessary on galvanized metal with G 90 Paint Grip.
1. Prepare a solution by dissolving 20 grams of copper sulfate in one liter (1000 grams) of water. Copper sulfate crystals may be purchased at most drug stores.
2. Solvent wash a small area per the procedure of SSPC-SP1.
3. Sand a small washed area using emery cloth.
4. Using a cotton swab saturated with the copper sulfate solution, apply a swipe to both sanded and unsanded washed areas.

5. If the sanded and unsanded surfaces turn black at the same time and that time is less than 10 seconds, there is no passivation on the surface other than light oil, and a normal degreasing/cleaning operation is sufficient preparation prior to the coating application. If the unsanded surface turns slower than the sanded surface, or not at all, a passivator of some type is present on the surface. If neither surface turns, the surface is probably an alloy of zinc or some other metal.
6. If the galvanized steel has been treated or passivated, the treatment or passivator must be removed by brush blasting. If this method is prohibited by environmental regulations, then chemical etching with Amchem's GALVAPREP SG-3 will be acceptable, if previously approved by the Architect. The chemical etching manufacturer's procedures should be followed carefully.
7. If the surface is determined to be an alloy by this test procedure, notify Architect and adhesion tests of the proposed coating applied over the proposed surface preparation must be conducted.
8. If no passivators are present, wash galvanized metal surfaces with mineral spirits to remove residual grease and oil.

F. Beginning of installation means acceptance of existing surfaces and substrate.

3.2 PREPARATION

A. Perform preparation and cleaning procedures in accordance with coating manufacturer's instructions for each substrate condition.

B. Fill open joints, cracks and crevices on steel buck frames with metal putty and sand smooth before painting.

C. Sand woodwork surfaces smooth before priming.

D. Coat pine knots and pitch streaks with shellac before painting.

E. Putty nail holes after the prime coat.

F. Remove hardware and accessories, plates, lighting fixtures and similar items which are not to be finish-painted or provide adequate surface-applied protection for these items in place.

G. Uncoated steel and iron surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

H. Shop primed steel surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

3.3 APPLICATION

A. Workmanship shall be of the highest quality. Mix and use paint materials in accord with the manufacturer's directions. Spread materials evenly, flow smoothly, and brush out without sags or runs.

B. Provide finish coats which are compatible with primer paints used. Provide barrier coats over incompatible primers where required.

C. When undercoats, stains or other conditions show through final paint coat, apply additional coats until paint film is of uniform color and sheen.

D. Finish the insides of wood cabinets, including backs of cabinet doors, as scheduled for the fronts and ends.

E. Between coats, sand enamel and lacquer finish on wood and metal surfaces to produce a smooth, even finish. Use #220 grit sandpaper or finer.

F. Tint priming coats and undercoats to approximate shade of final coat to assure uniformity of color in the finish. Touch up suction spots and "hot spots" before applying the last coat to produce an even result in the finish coat.

G. Exposed ductwork, piping and conduit in finished, occupied areas shall be painted the same color as the wall or ceiling against which it is installed, unless otherwise noted.

H. Apply the finish coat on gypsum board, plaster, and concrete surfaces with rollers.

I. On concrete masonry unit wall surfaces without a block filler, apply the first coat of paint with a spray gun.

J. Apply paint to sound absorbing concrete masonry units with brushes and/or rollers; do not spray.
   1. Do not paint fibrous fillers of sound absorbing concrete masonry units.
   2. Do not allow any paint, primer, or block filler to enter acoustic cells or impinge upon acoustic fillers in any way, including but not limited to, by overspray of spray-applied paint, or by drips, runs, sags, or splashes of paint, or through careless or negligent application of paint.
   3. No paint shall be allowed on fibrous fillers of sound absorbing concrete masonry units; otherwise, sound absorbing concrete masonry units and fibrous fillers shall be replaced at no cost to Owner.

3.4 TOUCH UP AND CLEAN

A. Touching Up: On completion, carefully touch up all holidays, marred and damaged spots, and work over all surfaces that have been repaired by other trades.

B. Cleaning: Remove spilled, splashed, and splattered paint from all surfaces. Do not mar surface finish of item being cleaned.

C. Reinstall the items removed under the provisions of paragraph above.

3.5 RE-PAINTING

A. Locations and Extent: The re-painting of existing surfaces shall be as follows:
   1. Painted wall, door and frame surfaces which have been reworked, cut into or patched, whether specifically designated on the drawings or not. Re-painting shall include all openings in existing walls.
   2. Entire rooms/areas, as designated on the drawings**.**

B. Colors: Match existing colors of corresponding surfaces except where new colors are scheduled**.**

C. Preparation:
   1. Clean surfaces to remove dust and dirt. Remove oil, grease, wax, loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers and other contaminants which would inhibit paint bonding to the old paint.
   2. Remove rust and loose and flaking paint by scraping and sanding.
   3. Glossy surfaces of old paint films must be clean and dull before repainting. Thorough washing with an abrasive cleanser will clean and dull in one operation, or wash thoroughly and dull by sanding.
   4. Spot prime any bare areas with an appropriate primer in conformance with the following paint schedule for new work.
   5. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 Sq.Ft. Allow to dry one week before testing adhesion per ASTM D 3359. If the coating system is incompatible, complete removal of existing finish is required.

D. Painting: Generally, apply one coat of finish paint over old surfaces, using the same materials scheduled in the paint schedule for like new surfaces**.**

E. Verification: Verify the extent of re-painting work at the building and make due allowance for cutting and patching required for installation of mechanical and electrical work.

3.6 PAINT SCHEDULE

A. The products listed below represent top of the line products of each manufacturer. These products are not presented as being equivalent, as there are too many variables to match each product across the board. Manufacturer's designations are:
   PPG Pittsburgh Paints
   SW The Sherwin-Williams Co.

B. Interior Metal
   1. Steel door frames, borrowed light frames, louvers and vision panel frames in doors, hollow metal doors, sound retardant doors, and ladders.
      1 primer coat
         PPG Red Inhibitive Steel Primer, 6-208

SW Kem Kromik Metal Primer B50WZ0001
2 finish coats
PPG Speedhide 6-1110
SW ProMar 200 Alkyd Semi-Gloss Enamel, Series B34 W 200

2. Steel pipe handrails and railings.
1 primer coat
PPG Red Inhibitive Steel Primer, 6-208
SW Kem Kromik Metal Primer B50WZ0001
2 finish coats
PPG Int/Ext Industrial Gloss Alkyd, 7-282 Series
SW Industrial Enamel, Series B54
3. Grilles, diffusers and registers in walls and ceilings.
1 finish coat
PPG Speedhide Alkyd Lo-Sheen, 6-90
SW ProMar 200 Alkyd Eg-Shel Enamel, Series B33 W 200
4. Other exposed iron and steel.
1 primer coat
PPG Speedhide Inhibitive Steel Primer, 6-208
SW Kem Kromik Metal Primer B50WZ0001
1 finish coat
PPG Speedhide Alkyd Lo-Sheen, 6-90
SW ProMar 200 Alkyd Eg-Shel Enamel, Series B33 W 200
5. Metal pipe, conduit, ductwork, hangers, supports and brackets.
1 primer coat
PPG Speedhide White Galvanized Steel Primer, 6-209
SW Galvite Paint, B50 WZ30
1 finish coat
PPG Speedhide Alkyd Lo-Sheen, 6-90
SW ProMar 200 Alkyd Eg-Shel Enamel, Series B33 W 200
6. Other exposed galvanized metal.
1 primer coat
PPG Speedhide White Galvanized Steel Primer, 6-209
SW Galvite Paint, B50 WZ30
2 finish coat
PPG Speedhide Alkyd Lo-Sheen, 6-90
SW ProMar 200 Alkyd Eg-Shel Enamel, Series B33 W 200

C. Interior Concrete Masonry
1. Concrete masonry unit walls scheduled to have Epoxy Paint.
1 filler coat
PPG Pitt-Glaze Int/Ext Latex Block Filler 16-90
SW Heavy Duty Block Filler, B42 W 46
2 finish coats
PPG Auquapon WB Waterborne Gloss Epoxy coating 98-1 Series
SW Water-Based Catalyzed Epoxy, Series B70, Gloss Hardener
2. Concrete masonry unit walls in Mechanical Rooms.
2 finish coats
PPG Speedhide Interior Acrylic Latex Semi-Gloss Enamel, 6-510 Series
SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200
3. Concrete masonry unit walls in Activity Room/Gymnasium
1 filler coat
PPG Pitt-Glaze Int/Ext Latex Block Filler 16-90
SW Heavy Duty Block Filler, B42 W 46
2 finish coats
PPG Speedhide Interior Acrylic Latex Semi-Gloss Enamel, 6-510 Series
SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200
4. Other concrete masonry unit walls.
1 filler coat
PPG Pitt-Glaze Int/Ext Latex Block Filler 16-90
SW Heavy Duty Block Filler, B42 W 46
2 finish coats
PPG Speedhide Interior Acrylic Latex Semi-Gloss Enamel, 6-510 Series
SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200

D. Gypsum Wallboard
   1. Gypsum board ceilings and furr downs.
      1 texture coat
         USG Multi-Purpose Texture - Sprayed Spatter - Light Finish Texture
         PPG Speedhide Acrylic Texture Coating 4-50
      3 finish coats
         PPG Speedhide Interior Flat Latex 6-70 Series
         SW ProMar 200 Latex Flat Wall Paint, Series B30 W 200
   2. Gypsum board walls scheduled to have Epoxy Paint.
      1 primer coat - fine sanded texture
         SW ProMar 200 Latex Wall Primer, B28 W 200
      2 finish coats
         PPG Aquapon WB Waterborne Gloss Epoxy Coating 98-1 Series
         SW Water-Based Catalyzed Epoxy, Series B70, Gloss Hardener
   3. Gypsum board walls above ceramic tile wainscot in corridors.
      1 texture coat
         USG Multi-Purpose Texture - Sprayed Spatter - Medium-Light Finish Texture
         PPG Speedhide Acrylic Texture Coating 4-50
      3 finish coats
         PPG Speedhide Interior Enamel Eggshell Latex 6-411 Series
         SW ProMar 200 Interior Latex Eg-Shel B20W2200 Series
   4. All other gypsum board walls.
      1 texture coat
         USG Multi-Purpose Texture - Sprayed Spatter - Medium-Light Finish Texture
         PPG Speedhide Acrylic Texture Coating 4-50
      1 primer coat
         SW PrepRite ProBlock Interior-Exterior Latex Primer-Sealer, B51-600 or approved equivalent
      2 finish coats
         PPG Speedhide Interior Semi-Gloss Latex Enamel 6-510 Series
         SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200

E. Interior Caulked Joints
   1. Caulking
      2 finish coats
         PPG Speedhide Interior Semi-Gloss Latex Enamel 6-510 Series
         SW Pro-Mar 200 Latex Semi-Gloss, B31 W 200

F. Exterior Metal
   1. Steel door frames and hollow metal doors.
      1 primer coat
         PPG Speedhide Int/Ext Rust Inhibitive Steel Primer 6-208 Series
         SW Kem Kromik Metal Primer B50WZ0001
      2 finish coats
         PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
         SW Industrial Enamel, Series B54
   2. Steel pipe, conduit, hangers supports and brackets.
      1 primer coat
         PPG Speedhide Int/Ext Galvanized Steel Primer 6-209
         SW Galvite Paint, B50 WZ30
      1 finish coat
         PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
         SW Industrial Enamel, Series B54
   3. Galvanized steel pipe handrails, railings, lintels, gates, metal fencing, ladders, ductwork, flashings, copings, roof hatches, tubular steel downspouts, galvanized gutters and downspouts, scuppers, ventilators, and louvers. (Reference test procedure for Passivators)
      1 primer coat
         PPG Speedhide Int/Ext Galvanized Steel Primer 6-209
         SW Galvite Paint, B50 WZ30
      2 finish coats
         PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
         SW Industrial Enamel, Series B54
   4. Items of mechanical and electrical machinery and equipment, including mechanical and electrical equipment on the roof which are 12" above roof line and are not concealed by a screen.
      1 finish coat
         PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series

SW Industrial Enamel, Series B54

5. Cast iron downspout boots.
   1 primer coat
      PPG Speedhide Int/Ext Rust Inhibitive Steel Primer 6-208 Series
      SW Kem Kromik Metal Primer B50WZ0001
   1 finish coat
      PPG Int/Ext Industrial Gloss Alkyd Enamel 7-282 Series
      SW Industrial Enamel, Series B54

G. Exterior Concrete Masonry Units
   1 filler coat
      PPG Pitt-Glaze Int/Ext Latex Block Filler 16-90
      SW Heavy Duty Block Filler, B42 W 46
   2 finish coats
      PPG Speedhide Exterior Flat Acrylic Latex 6-610 Series
      SW A-100 Exterior Flat, A6-100 Series

END OF SECTION

SECTION 10 11 16

MARKERBOARDS AND TACKBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Framed markerboards and tackboards.

B. Related Requirements:
1. Section 06 10 00 - Rough Carpentry; wood grounds.
2. Section 06 40 00 – Architectural Woodwork, display cases.
3. Section 09 72 16 - Vinyl-coated Fabric Wall Covering.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements:
1. Reflectivity: Not to exceed specified range when tested at 60 degrees with a gloss meter in accordance with ASTM D 523.
2. Contrast for marker boards (Light and Dark Effects): not more than 11.7 when tested with a BYK-Gardner Wave Scan 5+ Measurement Device showing visual acuity to the human eye at distances greater than 10 feet.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

B. Product Data: Include complete manufacturer's catalog cuts and data sheets of anchors, fasteners, color chips (photographic reproductions are not acceptable) and installation requirements.

C. Shop Drawings:
1. Include types of units provided, location within each room, and length of each unit.
2. Include dimensioned elevation drawings of each board assembly indicating joint locations and type of joint where required, and board mounting distances from floors.
3. Include cross-section details showing each type of product and components; trim, face, core, backing materials and thickness, and key to elevations.
4. Show anchorage details.
5. Show installation details.

D. Samples: Submit a 12" x 12" sample of each type of markerboard and tackboard. Submit a 6" long sample of each component of exposed trim.

E. Quality Control Submittals:
1. Test Reports: Copies of test reports, from certified testing agency, verifying that products have been tested and meet the specified performance requirements.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA.

B. Maintenance Data: Include data on regular cleaning, and stain removal.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame/smoke rating for vinyl fabric covered tackboards in accordance with ASTM E 84.

B. BYK-Gardner Wavescan 5+ wavelength ranges.

C. Porcelain Enamel Institute (PEI): PEI-1002, Manual and Performance Specifications for Porcelain Enamel Writing Surfaces (Whiteboards).

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.8 WARRANTY

A. Assembled Units: Manufacturer's standard 1-year warranty against defects in materials and workmanship.

B. Special Warranty for Porcelain-enamel Face Sheets: Manufacturer's standard Life-of-the-building warranty in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship. Failures include, but are not limited to: 1) Surface lose original writing and erasing qualities; 2) Surfaces become slick or shiny; 3) Surfaces exhibit crazing, cracking, or flaking.

PART 2 - PRODUCTS

2.1 MATERIALS

A. (MB) Liquid Chalk Type Board: Provide projectable porcelain enamel steel liquid chalk writing system, 4'-0" height by length indicated. Product/ manufacturer; one of the following:
LCS White Board; Claridge Products and Equipment, Inc.
Porcelain on Steel Markerboards; Platinum Visual Systems™; a division of abc School Equipment
1. Face sheet of 24 gage leveled enameling steel with porcelain enamel writing surface.
2. Core material of nominal 1/2" thick fiberboard or double-ply hardboard.
3. Panel backing of 0.015" sheet aluminum or 26 gage sheet steel.
4. Manufacturer shall factory assemble and bond together the face sheet, core and backing sheet.
5. Colors shall be as selected by Architect.
6. Markerboard panel shall be up to 16'-0" in length without joints.

B. Frames and Trim: Provide not less than 1-1/2" wide, .062-inch thick, extruded aluminum frames and trim. Finish for exposed trim surfaces shall be clear satin anodized aluminum. Snap-on type trim is not acceptable. Product/manufacturer; one of the following:
Series 1; Claridge Products and Equipment, Inc.
HTS; Platinum Visual Systems™; a division of abc School Equipment

C. Joint Strips: H-shaped aluminum in single pieces for full height of boards.
1. At vertical joints within markerboards, color the strips to match the markerboards.
2. At vertical joints between markerboards and tackboards, strips shall be anodized aluminum.

D. Map Rails: 1" wide of extruded aluminum with cork insert and Claridge No. 51ES type end stops. Furnish one No. 51M metal map hook for each linear foot of map rail and two No. 51FH flag holders for each room with map rails. Finish map rail to match the markerboard frames."

E. Chalktroughs: Heavy tubular type of extruded aluminum with cast aluminum end caps, finished to match the markerboard frames.

F. Adhesive: Flash-proof type furnished or recommended by the manufacturer.

2.2 FABRICATION

A. Fabricating Boards: Markerboards and tackboards shall be factory framed units up to 16'-0" one piece in length. Boards too large to be factory framed shall be assembled on the job to match the factory-built boards.
1. Assemble frames with hairline joints. Corner joints shall be mitered. There shall be no exposed face fasteners of any sort.

2. Make up boards in single sheets without joints where possible. Where vertical joints are necessary, space them symmetrically and use joint strips to cover them. Horizontal joints are not acceptable.
3. Vertical joints between markerboard and tackboard in the same frame shall be covered with single mullion trim pieces. Double mullions at these joints will not be acceptable.
4. Provide a map rail across the top of each markerboard unit.
5. Provide a chalktrough under each markerboard unit except markerboards at gymnasium/activity/ weight/aerobics rooms
6. Manufacturer's labels shall not be exposed to view.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Verify surfaces to receive units are true and plumb. Report unsuitable conditions to the responsible contractor for correction prior to installation.
   2. Verify moisture and temperature levels of substrate and environment have stabilized.

3.2 INSTALLATION

A. Erecting Framed Units: Install framed markerboards and tackboards in conformance with the manufacturer's instructions using continuous wall hangers and adjustable mounting clip angles.
   1. On masonry walls, secure the hangers with screws into metal expansion shields or with toggle bolts.
   2. On gypsum wallboard partitions, locate the hangers to engage the steel stud flanges where possible and secure with molly bolts or self-drilling fasteners into the studs, or attach to wood blocking with suitable length screws.
   3. On back of markerboards, field install blocking pads at 16" on centers horizontally and vertically. Apply manufacturer's recommended adhesive evenly over entire surface of each pad using a serrated trowel.
   4. The installed boards shall be flat, plumb, square and rigid.
   5. Mounting Height: From finished floor to bottom of chalkrail or bottom of tackboard shall be:
      Kindergarten / Pre-Kindergarten - 24"
      Elementary - 30"
      Intermediate (4th and 5th) - 32"
      Junior High / Middle School - 36"
      Senior High - 36"
      Adult-only Locations - 36"

3.3 CLEANING

A. Remove crates, cartons and rubbish from the premises and leave the rooms broom clean. Clean down board surfaces to leave them in perfect condition.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 14 00

IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cast aluminum letters
2. Interior room identification signs.
3. Exterior room identification signs.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: Submit manufacturer's complete line of color samples, 1" x 3", for initial color selection.

C. Invoices: Submit certified copies of invoices indicating description and quantity of signs delivered and installed.

D. Template: Submit full-size template drawing for approval:
1. Aluminum letter size, stock, spacing, anchorage devices, etc.

1.3 PRE-INSTALLATION CONFERENCE

A. Aluminum Letter Pre-installation Meeting: Contractor shall schedule a pre-installation meeting at the project site with the Architect, Contractor and building letter installer for approval of template field layout prior to beginning of installation.

1.4 QUALITY ASSURANCE

A. Interior signs shall be provided by a single source with at least five years' experience successfully providing signs of similar type and scope.

B. Signs shall comply with the Texas Accessibility Standards (TAS) and other laws and ordinances of authorities having jurisdiction. Braille shall be Grade II, having dimensions as required to meet TAS.

1.5 PACKING, DELIVERY, AND STORAGE

A. Deliver components correctly packaged to prevent damage. Pack modules and back-up plates unassembled to allow for mechanical mounting of backplate to wall with concealed fasteners.

B. Individually and clearly identify each sign number, type, location to be installed, mounting instructions, and other pertinent information.

1.6 WARRANTY

A. Cast Aluminum Letters: Provide 5-year manufacturer's warranty.

PART 2 - PRODUCTS

2.1 CAST ALUMINUM LETTERS

A. Basis of Design: Provide cast aluminum letters as manufactured by A.R.K. Ramos Mfg Signage Systems.

B. Type: Custom fabricated letters and numbers specified herein and shown on elevations in the drawings. Letters to be cast aluminum with clear anodized finish.
1. Sign to read as referenced on drawings.

C. Material: Manufacturer's standard aluminum alloy for casting. Screws shall be stainless steel.

D. Fabrication:
1. Letters shall be cast with smooth flat faces, sharp corners, true lines and accurate profiles.
2. Cast letters shall be free of pits, scale, and holes, or other defects and faces shall be mechanically finished to a satin texture.
3. Provide at least two points of attachment for each letter.
4. Lighting: Provide lighting system equal to soft-glow lighting system by A.R.K. Ramos.

E. Pre-cleaning: Immerse the letters in hot alkaline cleaner to remove contamination.

F. Clear Anodic Finish: Manufacturer's standard clear anodic coating, 0.018 inch or thicker, over a satin (directionally textured) mechanical finish.

2.2 INTERIOR IDENTIFICATION GRAPHICS

A. "InTouch" photopolymer plaque signs as manufactured by ASI Sign Systems, Inc. (8181 Jetstar Drive, Suite 100, Irving, Texas, 75063) or approved equivalent.
1. Manufacture face panels utilizing an 1/8" integral photopolymer panel.
2. Face panel tactile and Grade 2 Braille graphics shall be raised a minimum of 1/32".
3. Treat the face panel to assure paint adhesion.
4. Colors to be selected by Architect to meet ADA requirements for contrast.
5. Characters and background of signs shall have eggshell, non-glare finish.
6. Sign edges shall be painted to match background.
7. Sign edges are to be smooth and free of saw marks and imperfections.
8. Sign design shall be as indicated on drawings.
9. Typeface font and size shall be per drawings.
10. Lettering shall be computer generated, accurately reproducing the letterform.
11. Provide matching coverplate for signs mounted on glass.

2.3 EXTERIOR ROOM IDENTIFICATION GRAPHICS

A. Wall-mounted plaque signs as manufactured by ASI-Modulex or approved equivalent. (Phone 972.915.3800)
1. Manufacture panels utilizing an aluminum panel.
2. Face panel tactile and Grade 2 Braille graphics shall be raised a minimum of 1/32".
3. Colors to be selected by Architect to meet ADA requirements for contrast.
4. Sign edges are to be smooth and free of imperfections.
5. Sign design shall be as indicated on drawings.
6. Typeface font and size shall be per drawings.
7. Lettering shall be computer generated, accurately reproducing the letterform.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Erecting Letters: Erect letters straight and level on the exterior face of building where shown.
1. Attached to face brick: Secure with threaded stud anchors set in non-staining, quick setting cement. Letters shall be flush mounted to masonry surfaces.
2. Attached to CMU wall: Secure letters to CMU wall with stainless steel threaded rods and non-staining, quick setting cement. Letters shall be flush mounted to masonry surfaces.
3. Bottom rail mounting on top of prefabricated aluminum canopy.
a. Attach continuous aluminum rail to top of aluminum canopy as indicated on the Drawings.
b. Drill and tap letters from the bottom, with stainless steel screws going through aluminum rails.
c. Provide a flattened base on letters with round bottoms (O, S, G, etc.) to receive studs.
d. Include tiebacks as recommended by letter fabricator.

B. Identification Graphics:
1. On hard surfaces (i.e. ceramic tile, masonry, or plastic laminate), install room identification signs plumb and square with the "Tuff-bond" silicone adhesive furnished by the manufacturer (foam tape is not allowed).
2. On painted gypsum wallboard or vinyl wallcovering, install room identification signs on backing plates with the "Tuff-bond" silicone adhesive furnished by the manufacturer (foam tape is not allowed).
a. The backing plate shall be 1/8" thick and shall be the same size as the face panel.

b. Screw the backing panel into molly bolts in the wall with two countersunk, flathead screws.

3. Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest tactile character and 60 inches maximum above the finish floor or ground surface, measured from the baseline of the highest tactile character.
4. Unless noted otherwise, install signs on latch side of the door such that clear floor space of 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
5. Installation shall comply with ADA requirements.
6. For signs mounted on glass, install matching coverplate on opposite side of glass and aligned with the sign.

3.2 CLEANING

A. On completion, clean exposed surfaces and leave free of defects.

B. Do not use abrasives.

3.3 COORDINATION

A. Contractor shall coordinate the installation of the identifying devices with other trades involved in the project.

3.4 DAMAGE

A. An identifying device which is scratched or defaced will be rejected.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 21 13.17

SOLID PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Solid phenolic toilet compartments and urinal screens.

B. Related Sections:
1. Section 05 50 00 - Metal Fabrications
2. Section 06 10 00 - Rough Carpentry: wood blocking for bracket attachments.
3. Section 10 28 00 - Toilet Accessories.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
1. Include complete manufacturer's catalog cuts and data sheets of hardware, anchors, fasteners, and installation requirements.
2. Submit literature documenting that the partition door latch meets Texas Accessibility Standards (TAS) requirements.

C. Shop Drawings: Include drawings for fabrication and erection of toilet compartment assemblies which are not fully described in manufacturer's data.

D. Samples:
1. Submit a sample, 6" by 6", of each finish and color selected (photographic reproductions of color are not acceptable).
2. Submit a sample of each item of hardware and material component.

1.3 SEQUENCING AND SCHEDULING

A. Coordinate work with placement of suspension members and anchorage devices. Supply rough-in data in sufficient time for concealed preparatory to be conducted.

1.4 WARRANTY

A. Submit manufacturer’s standard 25-year warranty against breakage, delamination, and corrosion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84, Class B; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

2.2 ACCEPTABLE MANUFACTURERS

A. Provide floor-mounted, overhead-braced toilet compartments. Product/manufacturer; one of the following:
Concord; Accurate Partitions Division, Kinkead Industries, Inc.
Embassy; Global Steel Products Corp.
Corinthian; Metpar Corp.
Academy; The Sanymetal Products Co., Inc.

B. Provide Floor and Wall Hung Urinal Screens: one of the following:
Floor and Wall Hung: Accurate Partitions Division, Kinkead Industries, Inc.

Floor and Wall Hung: Global Steel Products Corp.
Floor and Wall Hung: Metpar Corp.
Floor and Wall Hung: The Sanymetal Products Co., Inc.

2.3 MATERIALS

A. Solid phenolic core with melamine facing on both sides, fused to substrate without visible glue line or seam. Provide units with eased edges and with minimum 3/4-inch thick doors and pilasters and minimum 1/2-inch thick panels and screens. Color(s) as selected by Architect from manufacturer's full range of colors.

B. Pilaster Shoes: ASTM A 167, Type 302/304 stainless steel of one-piece construction, 3" high, finish to match hardware.

C. Headrails: Extruded, polished anodized aluminum in anti-grip profile.

2.4 FABRICATION

A. Fabricate flush compartment panels, pilasters, and doors to the layout indicated with the following minimum dimensions.
   1. Where grab bars are indicated, provide a min. 32" wide (clear opening) door.
   2. At other locations, standard compartments shall have a 24" wide in-swinging door, unless specifically detailed and dimensioned otherwise.
   3. Doors and compartments panels 58" in length with a 12" clearance between floor and bottom of panels and doors. Pilasters shall be floor mounted, overhead braced, 82" high.
   4. Urinal screens 18" by 42" high.

B. Hardware: Provide hardware and fittings for compartment system of polished stainless steel. Stirrup brackets only may be heat-treated extruded aluminum with bright anodized finish.
   1. Hinges: Full length extruded aluminum in bright dip anodized finish or 14 gauge stainless steel continuous piano hinge. Hinges shall be fastened with stainless steel screws.
   2. Latches: Heavy-duty extruded aluminum (6463-T5 alloy) and provision for emergency access and paddle handle on accessible stalls in compliance with the ADA. Latch housing shall have bright dip anodized finish.
   3. Strikes and Keepers: Wrap-around type with rubber bumper, mounted with through bolts.
   4. Coat hooks with rubber bumpers for in-swinging doors.
   5. Pulls: Provide pulls adjacent to the latch on both sides of the toilet partition door. Furnish with wall bumpers where required to prevent doors from striking wall.
   6. Brackets: Heavy duty aluminum (6463-T5 alloy) full length continuous wall brackets. The use of U-type brackets is not acceptable.
   7. Fasteners: Vandal proof (one-way) screws and sex bolts of chrome-plated brass or stainless steel for all exposed locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check areas scheduled to receive partitions for correct dimensions, plumbness of walls, soundness of wall surfaces, location of built-in framing/anchorages/bracing, and other conditions that would affect proper installation of holding brackets and anchorage or suspension devices.

B. Verify spacing of plumbing fixtures to assure compatibility with installation of partitions.

3.2 INSTALLATION

A. Install compartments rigid, straight, plumb, and with horizontal lines level. Drilling, cutting, and fitting to room finish shall be concealed in the finished work. Clearance at vertical edges of doors shall be uniform from top to bottom, and doors shall be free of warp and wind. Provide clearances of not more than ½" between pilasters and panels, and not more than 1" between panels and walls.
   1. Attach dividing compartments to the back wall with continuous wall brackets and at the front to the pilasters with the same type brackets. The use of U-type brackets is not acceptable.
   2. Attach overhead braces to walls with heavy saddle-type brackets.

3. Attach pilasters to floor with ⅜" threaded studs, washers, lock nuts, expansion shields (minimum of 2" penetration into concrete), and pilaster brackets. Level, plumb, and tighten the installation with the leveling device. Conceal the floor anchorage and bases with pilaster shoe assembly having concealed snap-down action on a concealed hold-down clip. Exposed fasteners on shoe will not be permitted.

3.3 ADJUST AND CLEAN

A. Adjusting: Adjust hardware just prior to final acceptance. Doors shall operate freely.
   1. For out-swinging doors, adjust hinges to hold doors closed.
   2. For in-swinging doors, adjust hinges to hold doors open at 30°.

B. Cleaning: Remove protective masking and clean surfaces, leaving them free of soil and imperfections.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 22 13

WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Woven wire mesh partitions.

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide woven wire mesh partition and door, including all hardware as manufactured by one of the following:
Acorn Wire & Iron Works, Inc.
Indiana Wire Products, Inc.
Miller Wire Works, Inc.
Newark Wire Works, Inc.
Standard Wire & Steel Works
Wire Crafters, Inc.

2.2 MATERIALS

A. Wire: No. 10 W & M gage open hearth steel.

B. Framing: Cold rolled steel channels, angles, and bars.

2.3 MANUFACTURE

A. Fabrication:
1. Wire Mesh: 10 gauge steel wire woven into 1-1/2" diamond mesh, crimped and clinched securely into frames.
2. Vertical Frames: 1-1/4" x 5/8" cold rolled "C" section channels with ¼" bolt holes at 12" o.c.
3. Horizontal Frames: 1" x 1/2" x 1/8" channels, tenoned at intersections. Wires shall pass through the center reinforcement channel.
4. Top Capping Bar: 2-1/4" x 1" cold rolled channel with 1/4" U-bolts at approximately 24" o.c.
5. Corner Posts: 1-1/4" x 1-1/4" x 1/8" angles with bolt holes to match partition.
6. Mullion Bars: 2" x 5/16" flats.
7. Floor Sockets: Cast iron, 2-1/2" high, with set screw alignment.
8. Door Frames: 1-1/4" x 1/2" x 1/8" channel with 1-1/4" x 1/8" flat bar cover on three sides, 1-3/8" x 3/4" x 1/8" full length angle riveted to lock side of door and door frame jamb.
9. Hinged Door Hardware: 1-1/2 pair butt hinges and continuous 12 ga. strike bar.
10. Locks: Each door shall have bronze mortise type cylinder lock operated by key outside and guarded, recessed knob inside. Locks shall be master keyed.
11. Accessories: Bolts, hardware and accessories for a complete installation.

B. Finish: Partition to be phosphate coated and receive one shop coat enamel electrostatically applied. Color to be selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Erect partitions plumb, rigid, properly aligned, and securely fastened in place, complying with drawings and manufacturer’s recommendations.

B. Provide additional field bracing as shown or necessary for rigid, secure installation.

3.2 ADJUST AND CLEAN

A. Adjust partition doors and hardware to work properly. Clean exposed surfaces and leave free of defects.

B. Touch up damaged finish after completing installation using field-applied paint to match color of shop-applied finish.

END OF SECTION

SECTION 10 22 39

FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manually operated, folding panel partition.

B. Related Work:
1. Section 05 50 00 - Metal Fabrications: Steel framing to support partition track.
2. Section 06 10 00 - Rough Carpentry: Wood blocking for partition track.

1.2 SUBMITTALS

A. Shop Drawings:
1. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Submit shop drawings of partition layout. Include details of track, trolleys, and hardware. Indicate loading to be imposed in the supporting structure. Show all anchorage, accessory items, caulking, and finishes.

B. Product Data:
1. Submit data describing partition fabrication and installation, including hardware.
2. Submit finish data.
3. Submit laboratory acoustical performance test report, written by the test facility.

1.3 QUALITY ASSURANCE

A. Flame Spread Rating: Provide partitions with a Class "A" flame-spread rating when tested in accordance with ASTM E 84.

B. Provide demonstration of system as described in Part 3 below.

1.4 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
1. Warranty period: Two (2) years.

PART 2 - PRODUCTS

2.1 PARTITIONS

A. Basis of Design Type: Modernfold "Acoustic-Seal" Paired Panel #932 manually operated, flat panels hinged in pairs, top supported with operable floor seals.
1. Products from the following Manufacturers equal to Basis of Design will be considered:
Kwik-Wall Company
Modernfold, Inc. (Dorma Kaba Group)

B. Sound Transmission Class (STC): STC rating shall be 45 (50 in rooms with acoustical insulation in walls) when tested in accordance with ASTM E 90 for test in 14'-0" x 9'-0" opening.

C. Panel Construction:
1. Panels shall be 3.25" thick.
2. Panel Skin: Minimum 21 ga. roll-formed steel wrapping around the panel edge. Panel skins shall be lockformed and welded directly to the frame for unitized construction.
3. Markerboard Panel Finish, full height: White enamel on steel, bonded to the face of the panel with horizontal trim without exposed fasteners.
4. Single Pass Doors:

a. Matching pass door same thickness and appearance as panels. ADA compliant pass door to be trimless and equipped with friction latch and flush pulls for panic operation. No threshold will be permitted. Provide manufacturer recommended hardware. Pull has selected by architect.

D. Sound Seals:
1. Vertical: Interlocking sound seals in each panel edge.
2. Horizontal:
a. Top closure seals shall be continuous multi-finger vinyl.
b. Provide automatic operable bottom seal. Seal shall automatically drop as panels are positioned.

E. Provide #17 suspension system consisting of a continuous roll formed 11 ga. steel track. Each panel shall be supported by a all-steel 4-wheel ball bearing trolley.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Partitions shall be installed by the manufacturer's authorized factory trained representative and shall achieve the specified sound rating.
1. Secure ceiling tracks to steel framing.
2. Erect the partitions in a substantial manner to be straight and plumb.

3.2 ADJUST AND CLEAN

A. Adjust partitions and hardware, and leave in perfect working order. Clean exposed surfaces and leave free of defects.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance and user personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION

SECTION 10 26 13

CORNER GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Corner guards.

B. Related Sections:
1. Section 09 21 16 - Gypsum Board Assemblies: gypsum board walls.
2. Section 09 30 13 - Tiling.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1.3 WARRANTY

A. Provide manufacturer’s limited lifetime warranty against material and manufacturing defects on stainless steel corner guards.

PART 2 - PRODUCTS

2.1 CORNER GUARDS

A. Stainless Steel Corner Guards: Provide corner guards as manufactured by Construction Specialties shall be manufactured from Type 304 stainless steel (meets NSF Standard 51), 16 gauge, #4 Satin Finish, 90º, 1/8” radius, or degree/radius necessary for applicable corner, with 1-1/2” wing, 8 foot length. Fasteners shall be pre-drilled beveled holes and Phillips head screws.
1. Provide one of the following products/manufacturers:
Stainless Steel Corner Guards; IPC Door and Wall Protection Systems, InPro Corporation
Model CO-8; Construction Specialties
Model CG-50; Pawling Corporation

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install corner/bumper guards in/on wall using manufacturer's anchoring devices and in compliance with manufacturer's instructions. Install true and plumb.
1. Install screw on stainless steel corner guards to wall securely using appropriate screws, as specified.

3.2 PROTECTION AND CLEANING

A. Protect surfaces from damage during construction.

B. At completion of the installation, clean all surfaces.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 26 23.13

IMPACT RESISTANT WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Impact-resistant sheet wall coverings.

B. Related Sections:
1. Section 09 21 16 - Gypsum Board Assemblies; light gauge framing, drywall and finishing.

1.2 SUBMITTALS

A. Product Data: Include physical characteristics, such as durability, resistance to fading, and flame resistance, for each impact-resistant wall protection system component indicated.

B. Shop Drawings: Show locations, extent, and installation details of each impact-resistant wall protection system component. Show methods of attachment to adjoining construction.

C. Samples for Verification: For the following products, showing the full range of color and texture variations expected in each impact-resistant wall protection system component. Prepare Samples from the same material to be used for the Work.
1. Sheet and Panel Wall Protection: 6-by-6-inch- square Samples of each impact-resistant wall protection system material required.
2. Kick plates, armor plates, bed locators, and doorknob protectors: One complete item of each type required.

D. Maintenance Data: For each impact-resistant wall protection system component to include in maintenance manuals specified in Division 1.
1. Include recommended methods and frequency for maintaining optimum condition of vinyl plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to vinyl plastic finishes and performance

1.3 QUALTIY ASSURANCE

A. Source Limitations: Obtain each color, grade, finish, and type of impact-resistant wall protection system component from a single source with resources to provide components of consistent quality in appearance and physical properties.

B. Fire-Test-Response Characteristics: Provide impact-resistant wall protection system components with the following surface-burning characteristics, as determined by testing materials identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify impact-resistant wall protection system components with appropriate markings of applicable testing and inspecting agency.
1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

C. Impact Strength: Provide impact-resistant wall protection system components with a minimum impact resistance of 25.4 ft-lbf/in. of width when tested according to ASTM D 256, Test Method A.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store wall surface-protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
1. Maintain room temperature within the storage area at not less than 70 deg. F during the period plastic materials are stored. Keep sheet material out of direct sunlight to avoid surface distortion.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install wall surface-protection system components until the space is enclosed and weatherproof and ambient temperature within the building is maintained at not less than 70 deg. F for not less than 72 hours before beginning installation. Do not install rigid plastic wall surface-protection systems until that temperature has been attained and is stabilized.

1.6 WARRANTY

A. Provide manufacturer's limited lifetime warranty against material and manufacturing defects.

PART 2 - PRODUCTS

2.1 PRODUCT/MANUFACTURERS

A. Basis-of-Design Product: The design for Impact Resistant Wall Protection specified is based on "Acrovyn by Design" as manufactured by Construction Specialties, Inc. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

B. Manufacturers: Subject to compliance with requirements, provide products of one of the following manufacturers:
1. Babcock-Davis.
2. Construction Specialties, Inc.
3. Inpro Corporation
4. Koroseal Wall Protection Systems, Muncy, PA; Ph: 800-628-0449; www.korogard.com.
5. Pawling Corporation.

2.2 IMPACT-RESISTANT SHEET WALL COVERINGS

A. Abuse-Resistant Sheet Wall Covering: Thermoplastic acrylic-vinyl material complying with specified fire-test-response characteristics, and chemical and stain resistant. Provide manufacturer's standard matching moldings and trim required for a complete installation.
1. Product: Construction Specialties, Inc. "Acrovyn By Design".
2. Size: 4 feet by 10 feet per sheet.
3. Sheet Thickness: 0.040 inch
4. High definition graphic file reverse printed on clear sheet and sealed with protective backer. Architect will supply custom artwork.
5. Design Height: As shown by drawings.
6. Trim and Joint Moldings: Extruded rigid thermoplastic acrylic-vinyl fabrications matching sheet wall covering color.
7. Mounting: Adhesive.

2.3 ACCESSORIES

A. Adhesive: Type recommended by the manufacturer for use with material on the substrate indicated.

2.4 FABRICATION

A. General: Fabricate impact-resistant wall systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including thicknesses of components.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions in which impact-resistant wall protection system components and impact-resistant wall covering materials will be installed.
1. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Impact-Resistant Wall Covering Materials: Wall surfaces to receive impact-resistant wall covering materials shall be dry and free from dirt, grease, loose paint, and scale.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Install impact-resistant wall protection system components level, plumb, and true to line without distortions.
   1. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Install the work of this section in strict accordance with the manufacturer's recommendations using approved adhesive.

C. Temperature at the time of installation must be between 65-75ºF and be maintained for at least 48 hours after the installation to allow for proper adhesive set-up.

D. Relative humidity shall not exceed 80%.

E. Do not expose wall covering to direct sunlight during or after installation. This will cause the surface temperature to rise, which in turn will cause bubbles and delamination.

F. Use the supplied 1/8” V-notch trowel to apply Heavy Duty Water Based Mastic Adhesive to an area of the wall surface that can be completed within the cure time of the adhesive. The 1/8” V-notch trowel must be used to maintain the warranty and fire rating by ensuring proper glue coverage. Make sure the entire area receives an even coat.

G. Do not allow the adhesive to overcure.

H. When applying the adhesive to the wall, the trowel must be held perpendicular, or 90 degrees, to the wall as possible.

3.4 CLEANING

A. General: Immediately on completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent. Clean metal components according to the manufacturer's written instructions.

B. Remove excess adhesive using methods and materials recommended by the manufacturer.

C. Remove surplus materials, rubbish, and debris, resulting from installation, on completion of work and leave installation areas in neat, clean condition

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Toilet accessories.

B. Related Sections:
1. Section 08 80 00 - Glazing: un-framed mirrors.
2. Section 10 21 13.17 - Solid Phenolic Toilet Compartments.

1.2 SUBMITTALS

A. Product Data:
1. Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
3. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

1.3 QUALITY ASSURANCE

A. Products: Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same area.
1. Stamped names or labels on exposed faces of units will not be permitted.
2. Provide locks where specified, with the same keying for all accessory units in the project.

1.4 COORDINATION

A. Accessibility Standards: Coordinate accessory locations with other work to prevent interference with clearances required for access under Texas Accessibility Standards (TAS), Architectural Barriers Act--Article 9102, Vernon's Texas Civil Statutes and Texas Government Code, Chapter 469.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Toilet accessories shall be of the quality manufactured by Bobrick Washroom Equipment, Inc. and are listed by Bobrick catalog numbers for convenience in identification. The use of a catalog number as a description of an item shall be taken to include the description or specification for the item in the manufacturer's catalog.

B. Toilet Accessories: Equivalent items of the following manufacturers are acceptable:
American Specialties, Inc.
Bradley Corp.
General Accessory Manufacturing Co. (GAMCO)
McKinney/Parker Washroom Accessories Corp.

2.2 BASIC MATERIALS

A. Stainless Steel: ASTM A 666, Type 304 with No. 4 satin finish.

B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30 castings.

C. Sheet Steel: ASTM A 1008, cold rolled, commercial quality.

D. Galvanized Steel Sheet: ASTM A 653, G60 (Z180).

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electro-deposited on base metal.

F. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q3, nominal 1/4" thick, with silvering, electroplated copper coating, and protective organic coating complying with ASTM C 1036.

G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

I. Keys: Provide universal keys for access to accessories for servicing and resupplying. Provide minimum of six keys.

2.3 ACCESSORIES

A. Toilet Tissue Dispensers (A): Owner Furnished; Contractor Installed.

B. Grab Bars (B): Model B-6806, lengths as shown on drawings; Model B-6861 at showers.

C. Mirrors (C): Model B-290 2436 or sizes as indicated.

D. Mirror, Unframed (D): Reference SECTION 08 80 00 - GLAZING.

E. Paper Towel Dispenser/Waste Receptacles (E1): Owner Furnished; Contractor Installed.

F. Sanitary Napkin Disposal Units (F): Model B-270.

G. Soap Dispensers, Wall-Mounted (G1): Owner Furnished; Contractor Installed.

H. Mop & Broom Holder/Custodian's Utility Shelves (J1): Model B-224 x 36", one per Custodian's Closet and where scheduled.

I. Coat/Robe Hooks (K1): Model B-211.

J. Shower Curtain Rod, Curtain and Hooks (L):
   1. Shower Curtain Rod: Model B-6107
   2. Shower Curtains: Model 204
      a. Provide correct widths of shower curtain for 36" openings and for 37" to 60" openings.
      b. Length of curtain shall be 72” at non-accessible shower compartment with curb.
      c. Length of curtain at accessible shower compartment without curb shall be 78”, installed with bottom of curtain 1” above threshold.
   3. Shower Curtain Hooks: Model 204-1

K. Shower Seat, Folding, L-Shaped (M1): Model B-5181.

L. Shower Seat, Folding, Rectangular (M2): Model B-5193.

M. Toilet Seat Cover Dispenser (R1): Model B-221, Surface mounted seat cover dispenser.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers’ written instructions and recommendations, using fasteners appropriate to substrate and recommended by manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated. Adhesive mountings and plastic rawl plug mounts will not be acceptable.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square.

C. At toilets with wheelchair compartments all toilet accessories shall be installed so that operating areas such as coin slots, pushbuttons, openings for towels, cups and waste are not more than 48" above finished floor for frontal approach.

D. Attach dispensers and cabinets to steel stud partitions with suitable hollow wall screw anchors. Attach dispensers and cabinets to masonry partitions with stainless steel expansion shields and machine screws.

E. Attach sanitary napkin disposal units and toilet tissue dispensers to toilet partition panels with stainless steel or chrome plated through bolts and hex cap nuts.

F. Install grab bars to withstand a downward load of at least 250 lbf. Attach grab bars to toilet partition panels with stainless steel through bolts and plated hex cap nuts. Attach grab bars to steel stud partitions with connector assemblies to steel anchors fastened to studs. Attach grab bars to masonry partitions with stainless steel expansion shields and machine screws.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer’s written recommendations.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 44 13

FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fire extinguishers and fire extinguisher cabinets.

1.2 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 fire extinguisher without cabinet.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include physical dimensions, operational features, color and finish, anchorage details, material descriptions and type of hardware.

C. Shop Drawings: Include rough-in measurements, locations, and details for cabinets.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5 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.
2. Conform to NFPA-10 requirements for extinguishers.
3. Provide units conforming with ANSI/UL 711.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

B. Store extinguishers in protected location until after final cleaning is completed.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do not store products subject to freeze damage in environments where damage could occur.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Provide multi-purpose dry chemical type fire extinguisher, 10 lbs. nominal capacity. Provide manufacturer's standard hook type bracket where fire extinguishers are noted without cabinets. Product/manufacturer; one of the following:
Cosmic 10E; J.L. Industries, Div. of Activar, Inc.

MP10; Larsen's Manufacturing Co.
Wing 10HB; Modern Metal Products
Model 3010; Potter-Roemer

B. At Kitchen provide wet chemical type fire extinguisher with a Class K UL rating. Provide manufacturer's standard wall mounting bracket. Product/manufacturer; one of the following:
Saturn 15 Model, JL Industries, Inc., Div. of Activar, Inc.
WC-6L Series Wet Chemical, Larsen's Manufacturing Co.
3260; Potter-Roemer/B260; Amerex

2.2 FIRE EXTINGUISHER CABINETS

A. Provide stainless steel trim and door. Doors shall be solid with vertical window and have continuous piano hinge. "Fire Extinguisher" vertical ascending silk-screened lettering in red. Product / manufacturer; one of the following:
Fire-FX 1037V10 Cosmopolitan; J.L. Industries, Div. of Activar, Inc.
FS SS2409-R4 Vertical Duo, Acrylic; Larsen's Manufacturing Co.
"Alta" Series No. 7063-DV-6; Potter-Roemer.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for type and capacity of fire extinguisher indicated, with plated or baked-enamel finish. Color shall be red.

B. Identification: Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface. Orientation shall be horizontal.

2.4 FABRICATION

A. Form body of cabinet with tight inside corners and seams.

B. Predrill holes for anchorage.

C. Form perimeter trim and door stiles by welding, filling, and grinding smooth.

D. Hinge doors for 180° opening with continuous piano hinge. Provide nylon roller type catch.

2.5 FINISHES

A. Extinguisher: Red enamel.

B. Cabinet Trim and Door: Stainless Steel

C. Cabinet Interior: White enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fire extinguisher cabinets at locations indicated in accordance with the manufacturer's instructions. Install level, plumb, secure. Install fire extinguisher cabinets with operable part of extinguisher at 48" above finished floor.

B. Install fire extinguishers within cabinets on mounting brackets, placed in such a manner that operating instructions face outward.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb. Apply identification decals above bracket-mounted fire extinguishers.

D. Service, charge (if required), and tag each fire extinguisher not more than five calendar days prior to substantial completion.

E. Maintain design of fire-rated partitions associated with cabinets.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 51 13

METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Metal lockers.

B. Related Sections:
1. Section 03 30 00 - Cast-in-Place Concrete; concrete in base.
2. Section 04 20 00 - Unit Masonry; Concrete masonry unit bases.
3. Section 06 10 00 - Rough Carpentry; wood sleepers and wood blocking.
4. Section 09 65 00 - Resilient Flooring; rubber base.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Submit complete manufacturer's catalog cuts and data sheets of hardware, anchors, fasteners and installation requirements.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show bas, sloping tops sand filler panels and other accessories. Include locker identification system.

D. Samples: Submit color chips (photographic reproductions of color are not acceptable).

1.3 QUALITY ASSURANCE

A. Uniformity: Provide each type of metal locker as produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation.

B. Store and protect lockers under provisions of SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

C. Protect locker finishes and adjacent surfaces from damage during installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Athletic Lockers: Materials and methods described are based on the specifications of List Industries, Inc. (www.listindustries.com) and are given to designate the quality of materials and workmanship required. Equivalent lockers as manufactured by one of the following will be acceptable:
DeBourgh (www.all-american-lockers.com)
Lyon Metal Products, Inc. (www.lyonmetal.com)
Penco (www.pencoproducts.com)

2.2 ATHLETIC LOCKERS (TYPES LK-A, LK-AA, LK-B, LK-C, LK-CA)

A. Provide all welded construction athletic lockers. Nuts, bolts, screws, and pop-rivets will not be allowed.
1. Doors: 14 ga. diamond perforated, 1" double bends on both sides and single ⅞" bend at top and bottom. Latch hooks shall be located directly across from hinges.

2. Vertical dividers: ¾" 13 ga. flattened expanded metal framed by 16 ga. hollow "T" sections designed to conceal sharp edges of divider with entire assembly mig welded. Dividers shall have channel bracing at the bottom forming a rigid frame for each locker unit.
3. Solid backs shall be 18 ga. cold rolled sheet steel.
4. Provide double-tier and multi-tier lockers as indicated.

B. Locks:
1. Recessed handle with:
a. Built-in combination with push-button combination change and master key control; Masterlock Series 1654/1655 - automatic locking.
b. Provide handicapped accessible latches on accessible lockers.

C. Trim: 16 gage steel filler strips to cover spaces between lockers and adjacent walls at ends of rows and elsewhere as may be required. Provide finished end panels for exposed ends of locker rows. Finish shall match lockers.

D. Equipment: Furnish each locker with the following items.
1. Single-tier Lockers:
a. Hat shelf, one double-prong hook, and not less than two single-prong wall hooks.
b. At handicapped accessible lockers, locker bottom must be a minimum of 15" from finish floor. If locker bottom is lower than 15” from finish floor, provide internal shelf at a minimum of 15” above finish floor.
c. At handicapped accessible lockers, hat shelf, hooks and handle with locker or hasp must be no higher than 48” from finish floor.
2. Six-tier Pass-through Front/Rear Entry Lockers:
a. Side-hinged doors.
b. Lockable door on front of each locker with one tamper-proof latch door on back to cover each set of six stacked lockers.
c. Corresponding rear number plates.
3. Provide Shelf, hanging rod and 2 single prong hook at Varsity Football Lockers.
4. Provide helmet shoulder pad rack at Varsity Football Lockers.

E. JV Football Lockers: Continuous Sloping Tops: Not less than 18 gauge sheet steel approximately 18 degrees pitch, in lengths as long as practical but not less than four lockers. To be installed in addition to the locker flat top with end closures for support. Finish to match exterior of lockers.

F. Pass through and Varsity Football: Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple framed locker unit. Finish to match exterior of lockers.

G. Finish:
1. Chemically pre-treat metal with degreasing and phosphatizing process.
2. Enamel powder coat paint finish electrostatically applied, baked, and properly cured to manufacturer’s specifications for optimum performance.
3. Finishes containing volatile organic compounds and subject to out-gassing are not acceptable.
4. Color: Lockers shall be one custom color exterior and shall be manufacturer's standard color interior. Colors as scheduled in Material Finish Key on drawings.

H. Number Plates: Aluminum with black filled numbers, fastened with rivets to the top of the front face of the locker, not in the recess. Number lockers consecutively as directed by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases and verify that bases are properly sized and located. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

B. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36" o.c. The use of sheet metal screws for assembly and installation is not allowed.

C. Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

3.3 ADJUST AND CLEAN

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint.

C. Touch-up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal locker manufacturer.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 56 13

METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Metal storage shelving.

1.2 SUBMITTALS

A. General: Submit following items in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include complete manufacturer's catalog cuts and data sheets, complete parts list, installation requirements, and all pertinent performance characteristics and criteria.

C. Shop Drawings: Indicate materials, construction, sizes, quantities, finishes, and installation details.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide metal storage shelving of the same manufacturer throughout the project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide metal storage shelving as manufactured by one of the following:
Lyon Workspace Products
Penco Products, Inc.
Republic Storage Systems Co.
Richards-Wilcox
Tennsco
Western Pacific Storage Systems

2.2 MATERIALS

A. Basis of Design: Provide RiveTier Long Span Shelving as manufactured by Western Pacific Storage Systems (1-800-270-0427).
1. Sizes: Refer to drawings for dimensions.
2. Metal Shelves: 22 gauge steel.
3. Standard Duty Angle Upright Post - LURH - 14 gauge steel.

2.3 FABRICATION

A. Fabricate metal storage shelving square and rigid with posts plumb and true, and shelves flat and free of dents or distortion. Fabricate exposed metal edges free of sharp edges dn burrs. Fabricate connections to form a rigid structure, free of buckling and warping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install metal storage shelving in strict accordance with manufacturer’s written instructions and recommendations.

B. Install metal storage shelving level, plumb, square, and true.

C. Install bracing as recommended by manufacturer and as required for stability.

3.2 PROTECTION

A. Protect the completed work from damage. Replace damaged items which cannot be repaired. Protect finished installation in accordance with SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

3.3 CLEANING

A. Upon completion of the building, clean the metal storage shelving. Leave the metal storage shelving free of defects and in ready-to-use condition.

B. Perform final cleaning in accordance with SECTION 01 74 13 - PROGRESS CLEANING.

END OF SECTION

SECTION 10 56 28

ATHLETIC MOBILE STORAGE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Portable, high-density storage carts and accessories for athletic equipment and apparel.

B. Related Sections:
   1. Section 03 - Concrete.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s data sheets, assembly and installation instructions, and description of furnished specialties and accessories.

B. Shop Drawings: Project-specific drawings indicating details of storage specialties layout and installation, including clearances, spacing, and relation to adjacent construction in plan, elevation, and section. Show components, assemblies, connections, attachments, and anchorage.

C. Samples: For each color and finish for each exposed storage specialties component.

D. Maintenance Data: Provide maintenance data.

E. Warranty: Submit sample meeting warranty requirements of this Section.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain storage specialties through one source from a single approved manufacturer.

B. COORDINATION

C. Coordinate installation of storage specialties to ensure proper installation and operation of each component. Coordinate clearances required for movement of portable units.

1.4 WARRANTY

A. Special Warranty: Manufacturer's written warranty indicating manufacturer’s intent to repair or replace storage specialties components that fail in materials or workmanship within 5 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:

B. Fracturing or breaking of unit components which results from normal wear and tear and normal use other than vandalism.

C. Delamination or other failures of glue bond of components.

D. Warping of components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.

PART 2 - PRODUCTS

A. MANUFACTURERS

B. Basis of Design: Provide GearBoss Team Carts and accessories. Storage specialties design is based upon product of the manufacturer below. Provide basis of design product.
   1. Wenger Corporation, Owatonna, MN; Telephone: (800)4WENGER (800-493-6437); Email: info@wengercorp.com; Website: www.wengercorp.com,
   2. No substitutions

C. MATERIALS

D. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221.

E. Steel Sheet: Cold-rolled, ASTM A 1008, commercial steel, Type B.

F. Steel Tubing: ASTM A 500, cold-formed steel tubing.

G. Medium-Density Fiberboard: ANSI A208.2, Grade MD, urea formaldehyde-free.

H. MDF 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.

2.2 PORTABLE STORAGE CARTS FOR ATHLETIC EQUIPMENT AND APPAREL

A. Portable Storage Carts, General: Track-mounted, portable, modular, high-density storage units with steel tube and sheet chassis and powder-painted steel tube upright frame, steel wire grille panels that support optional cart accessories with retractable guides in floor track and 4 swivel casters with non-marring wheels.

B. Top Panel: Medium density fiberboard, 5/8 inch thick, with high-pressure decorative laminate.

C. Portable Storage Cart Designation:

D. Gliding X Carts: High-density storage carts slide together and apart, rolling laterally on fixed aluminum floor track to create aisles between carts and closing back together when not in use to reduce storage space by at least half. Designed to encourage airflow and improve sanitation and odor issues. Modular system purpose made for bulky equipment.
   1. Dimensions: 32 inch (81 cm) wide by 78 inch (198 cm) long by 79 inch (201 cm) high or as indicated on the drawings with shoulder pad stackers (4 per cart).
   2. Dimensions: 48 inch (122 cm) wide by 78 inch (198 cm) long by 79 inch (201 cm) high or as indicated on the drawings with truss bars (4 carts contain 2 truss bars, 14 helmet hangers and 2 carts contain 4 garment bars.)
   3. Chassis: Fabricated from 16-gauge, 14-gauge, and 12-gauge welded steel components.
   4. Upright Tubes: 2 inch (51 mm) diameter, 16-gauge steel tubing.
   5. End Frames: Resistant welded heavy duty steel wire grill with 1 inch (25 mm) opening.
   6. Wheels: 6 inch (152 mm) heavy duty.
   7. Roof Panel: Solid 5/8 inch (17 mm) thermofused composite wood with aluminum extrusions, rated for 150 pound (67.5 kg) load.
   8. Paint color as selected from manufacturer's standard range of colors.

E. High-Density, Heavy Duty Gliding Cart Accessories:
   1. Storage Cart Floor Track: Extruded aluminum track, 6 by 0.97 inch tall (152 by 25 mm tall), configured to receive storage unit track guides. Includes appropriate track or island stops.
   2. Track: Floor surface mounted track.
   3. Shelves:
      a. Description: Steel wire grille, powder-painted, 150 lb. (68 kg) capacity per shelf unit, bracket-hung from steel powder-painted, grille panels, adjustable in 1 inch (25.4 mm) height increments.
      b. Shelf Lips: Steel sheet lip, powder-painted, 2-1/2 or 4 inch (63.5 or 102 mm) high, fastened to shelf with adjustable thumbscrews.
   4. Football Shoulder Pad Stackers: Built-in shoulder pad form, powder-painted steel sheet and steel wire upright stacker, with 4 wheels, wire handles, configured to fit into storage unit chassis; 18 to 20 pad capacity.
   5. Garment Bars: Steel tube, 1-1/2 inch (38 mm) diameter, powder-painted, bracket hung from steel grille end panels, adjustable in 1 inch (25.4 mm) increments.
   6. Truss Hangers: Double-bar steel truss hanger for support of helmet hangers and shoulder pad hangers.
   7. Football Helmet Hanger: Formed, powder-painted steel wire, 5/16 inch diameter, 8 helmet capacity.
   8. Accessory Colors: as selected from manufacturer's standard range.

F. Mobile Team Carts: High-density storage carts purpose made for bulky equipment. Mounting system allows equipment to store compactly, engineered to leave the track to travel to gyms, sidelines, practice areas, parking lots or wherever needed. Do not expose to exterior weather conditions for extended periods of time. Carts may be parked and locked in any location or temporary space to create safe secure storage.

1. Dimensions: 32 inch (81 cm) wide by 78 inch (198 cm) long by 79 inch (201 cm) high containing 2 shelves and 1 garmet bar, each.
2. Chassis: Fabricated from 16-gauge, 14-gauge, and 12-gauge welded steel components.
3. Upright Tubes: 2 inch (51 mm) diameter, 16-gauge steel tubing.
4. End Frames: Resistant welded heavy duty steel wire grill with 1 inch (25 mm) opening.
5. Wheels: 6 inch (152 mm) heavy duty swivel casters.
6. Roof Panel: Solid 5/8 inch (17 mm) thermofused composite wood with aluminum extrusions, rated for 150 pound (67.5 kg) load.
7. Paint color as selected from manufacturer's standard range of colors.

G. High-Density, Heavy Duty Mobile Cart Materials:
1. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B221.
2. Sheet Steel: Cold-rolled, ASTM A1008, commercial steel, type B.
3. Steel Tube: ASTM A501, hot-formed steel tubing.
4. Steel Tube: ASTM A500, cold-formed steel tubing.
5. Steel Wire: ASTM C510, cold drawn steel wire.
6. Anchors and Fasteners:
   a. Factory Provided: Material, type, and sizeh recommended by manufacturer for secure anchorage to substrate.
   b. Field Installed: Manufacturer-recommended fasteners furnished by Contractor as required for locker substrate and project requirements.

H. High-Density, Heavy Duty Mobile Cart Fabrication:
1. Fabricate components square, and rigid. Make exposed metal safe to touch and free of sharp ends or burrs.
2. Form frames, panels, doors, and accessories from one-piece, or one rigid assembly, unless specifically shown on Shop Drawings.
3. Factory preassemble metal components by welding all joints, and connections; with no bolts, nuts, screws, or rivets used in assembly, except as required for knock down shipping and attachment to mounting surfaces.

I. High-Density, Heavy Duty Mobile Cart Accessories:
1. Storage Cart Floor Track: Extruded aluminum track, 6 by 0.97 inch tall (152 by 25 mm tall), configured to receive storage unit track guides. Includes appropriate track or island stops.
   a. Track: Floor surface mounted track.
2. Shelves:
   a. Description: Steel wire grille, powder-painted, 150 lb. (68 kg) capacity per shelf unit, bracket-hung from steel powder-painted, grille panels, adjustable in 1 inch (25.4 mm) height increments.
   b. Depth: 32 inch (810 mm).
   c. Shelf Lips: Steel sheet lip, powder-painted, 2-1/2 or 4 inch (63.5 or 102 mm) high, fastened to shelf with adjustable thumbscrews.
3. Garment Bars: Steel tube, 1-1/2 inch (38 mm) diameter, powder-painted, bracket hung from steel grille end panels, adjustable in 1 inch (25.4 mm) increments.
4. Accessory Colors: as selected from manufacturer's standard range.

2.3 FINISHES

A. Aluminum: Mill finish.

B. Steel Tube, Sheet, and Wire Grille: Iron phosphate precoat and thermoset epoxy resin powder coat (baked) finish. Color as selected by Architect.

C. Steel Tube, Exposed: Chrome plated.

D. Medium Density Fiberboard: High-pressure decorative laminate, color and pattern as selected from manufacturer's full range.

2.4 METAL SHELVING UNITS

A. Metal Shelving Systems, Shelf Starter Bay, Shelf Add-On Bay, and Shelves by Wenger Corporation: Cantilever-type modular metal storage shelving system comprised of the following components:
1. Structural Performance:
   a. Allowable Load Rating: 1000 lb. (373 kg) per 4 by 8-foot (1219 by 2438-mm) bay.
   b. Load-Carrying Capacity per 48 inch (1219 mm) Shelf: 250 lb. (113 kg).

c. Shelf Unit Uprights: Steel tube, metallic-coated, 2-inch (50.8 mm) square, 0.109-inch (2.76 mm) thick, with perforations on all four sides at 1 inch (25 mm) on center.
d. Horizontal Stringer: Formed sheet steel, metallic-coated, 0.075-inch (1.9-mm) thick.
e. Shelf Cross Tubes: 14 gauge steel tube, metallic-coated, 5/8-inch (22-mm) square.
f. Shelf Brackets: Formed steel, 0.015-inch (0.38-mm) thick.
g. Laminate-Clad Wood Panels: Core material and thickness indicated, finished with thermally-fused anti-microbial polyester surfacing on both sides.
h. Unit Width: 48 inch (1219 mm) center-to-center unless otherwise indicated.
i. Unit Height: 96 inches (2438 mm).
j. Unit Height: As indicated on the Drawings.
k. Shelves can be adjusted in 1 inch (25 mm) increment without tools.

B. Metal Shelving Materials:
1. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B221.
2. Sheet Steel: Cold-rolled, ASTM A1008, commercial steel, type B.
3. Steel Tube: ASTM A501, hot-formed steel tubing.
4. Steel Wire: ASTM C510, cold drawn steel wire.
5. Particleboard: To ANSI A208.1, minimum 43 lb/cu. ft. (689 kg/cu. m) density.
6. Plywood: APA standards PS1-98 section 5.7.4 or 5.7.1 or ANSI /HPVA HP-1-2004 Panel provide with HDF skins to prevent grain telegraphing.
7. Steel Tube: ASTM A500, cold-formed steel tubing.
8. Laminate Finish: Composite, of thickness indicated, finished with thermally-fused anti-microbial polyester surfacing on both sides, meeting performance properties of NEMA LD3 for VGS grade, with heat bonded, radiused, 3 mm thick extruded PVC edge banding.
   a. Surface Abrasion Resistance: Taber Wheel, 400 cycles, for solid colors.
9. PVC Edge Banding: LMA EDG-1, radiused PVC extrusions, 3 mm thick, heat-bonded.
10. Anchors and Fasteners:
    a. Factory Provided: Material, type, and size recommended by manufacturer for secure anchorage to substrate.
    b. Field Installed: Manufacturer-recommended fasteners furnished by Contractor as required for locker substrate and project requirements.

C. Metal Shelving Fabrication:
1. Fabricate components square, and rigid. Make exposed metal safe to touch and free of sharp ends or burrs.
2. Form frames, panels, doors, and accessories from one-piece, or one rigid assembly, unless specifically shown on Shop Drawings.
3. Factory preassemble metal components by welding all joints, and connections; with no bolts, nuts, screws, or rivets used in assembly, except as required for knock down shipping and attachment to mounting surfaces.

D. Metal Shelving Accessories:
1. Shelf Depth: 30.5 inches (775 mm) with 4 cross tubes.
2. Lock Box: Steel sides and bottom, polished aluminum front, key-tab lock, hinged door panel lockable with a key.
3. Work Surface: Particleboard laminate-clad panel with graphite high wear laminate with black edge band, 1-1/8-inch (28.6-mm) thick, inserted into 30-1/2 inch (775 mm) cantilever shelf bracket over cross tubes. Quantity of work surfaces as indicated on Drawings.
4. Garment Hanger: Steel round tube mounts underneath shelf; powder-coat finish, black. Quantity of garment bars as indicated on Drawings.

E. Metal Shelving Finishes: Manufacturer's standard finish, color as selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

A. EXAMINATION

B. Examine installation areas for storage specialties for compliance with requirements for installation tolerances, including required overhead clearances and floor levelness, and other existing conditions affecting installation and performance of storage specialties.

C. Proceed with installation of storage specialties upon correction of unsatisfactory conditions.

3.2 INSTALLATION

A. Assemble units. Set portable carts in indicated storage position on track.

3.3 DEMONSTRATION

A. Train Owner's personnel to adjust, operate, and maintain storage specialties.

B. Turn over keys, tools, and operation and maintenance instructions to Owner.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Install system in accordance with manufacturer's written instructions and recommendations. All tracks to be leveled to tolerance not exceeding 1/32" over 10' run. All gaps between track and floor to be filled with fast setting cement, minimum 8,000 PSI rating to form a solid base. All rails to be anchored to floor. Shims not acceptable.

4.2 CLEAN UP

A. Leave installation in broom clean condition, complete and ready for installation of floor finish by others.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 73 26

PREFABRICATED WALKWAY COVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Prefabricated walkway canopies and wall-mounted suspended canopies.

B. Related Requirements:
1. Section 03 30 00 - Cast-in-place Concrete.
2. Section 07 92 00 - Joint Sealants.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Include drawings showing small scale layouts of prefabricated walkway canopies and large-scale details of edge conditions, joints, expansion joints, anchorages, trim, closures, and special details.

C. Samples: Submit two 12" square samples of finished metal panels.

D. Certification: Submit design calculations sealed and signed by an engineer registered in the State of Texas. Design calculations shall state that the protective cover system design complies with the wind requirements of all governing jurisdictions, the stability criteria of applicable building code, and all other governing criteria.
1. At all freestanding, column-supported walkway covers and canopies, the footings shall be designed by the manufacturer and constructed by General Contractor, unless detailed otherwise. Concrete footings are required to be provided for all column-supported walkway covers and canopies whether indicated on the drawings or not. Submittals shall include sealed calcs and shop drawings for footings.
2. At all building-connected, column-supported walkway covers and canopies, the footings shall be designed by the Architect’s structural engineer and constructed by General Contractor, unless detailed otherwise.

1.3 QUALITY ASSURANCE

A. Wind Loading: Fabricate and install prefabricated walkway canopies and other components of system to comply with code requirements for resisting wind effects based on a 146 mph wind.

B. Installer Qualifications: Engage an experienced installer who is an authorized representative of the canopy manufacturer and has completed installation of canopies similar in material, design, and extent to canopy required for this project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide prefabricated walkway canopies as manufactured by one of the following:
AVAdek
Dittmer Architectural Aluminum
Mapes Industries, Inc.

2.2 MATERIALS

A. Aluminum Sheets: Extruded aluminum sections, Alloy 6063, T6 temper.

B. Structural Supports: Extruded aluminum sections, Alloy 6063, T6 temper.

C. Fasteners: Manufacturer's standard non-corrosive types, with heads gasketed.

D. Accessories: Provide components required for a complete prefabricated walkway canopy system, including fascia, trim, closures, clips, fillers, and similar items. Match materials and finishes of prefabricated walkway canopy framing.

E. Finish and color selection of each component shall be chosen from the manufacturer's color selections and shall include:
   1. Hardcoat bronze anodized finish (minimum thickness of 0.7 mils).

2.3 FABRICATION

A. General: Fabricate and finish canopies and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and dimensional requirements. Internal gutters shall connect to weep system.

B. Wall-mounted Suspended Canopies:
   1. Hanger Rods: Round aluminum rods with baked enamel finish.
   2. Gutter shall scupper out at each end.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive prefabricated walkway canopies for conditions that will adversely affect the execution and quality of work. Do not start this work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General: Comply with canopy fabricator's and material manufacturer's instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor supports and other components of the work securely in place, with provisions for thermal and structural movement. Install expansion joints to provide for thermal and structural movement.

3.3 CLEANING AND PROTECTION

A. Damaged Units: Replace canopies and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.

B. Cleaning: Upon completion of canopy installation, clean finished surfaces as recommended by canopy manufacturer, and maintain in a clean condition during construction.

END OF SECTION

SECTION 10 82 16

EQUIPMENT SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Roof-top equipment screens including framing and attachment.

1.2 SYSTEM DESCRIPTION

A. Design Criteria: Manufacturer is responsible for the structural design of materials, assembly and attachments to resist snow, wind, suction and uplift loading without damage or permanent set as indicated on structural drawings.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Submit manufacturer's catalog data, detail sheets, specification and other data sufficient to indicate compliance with these specifications.

C. Shop Drawings: Indicate layouts heights, component connection details, and details of interface with adjacent construction. Mark data to indicate roof top mechanical equipment to be enclosed.

D. Samples, Color Selection: Submit paint chips with full range of colors (minimum of eight) available for Architect's selection.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five (5) years documented experience producing systems specified in this section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

B. Storage and Handling: Protect materials and finishes during handling and installation to prevent damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Take measurements of actual Roof top unit for fit without gaps. Indicate measurements on shop drawings fully documenting field conditions that may interfere with the screen system installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Products: "LS-52V" by AWV (phone: 1 419 865-5000; web site: www.awv.com).

2.2 MATERIALS

A. Framing: Aluminum Plate, Blades and Bar: ASTM B 221, extruded aluminum alloy 6061-T5 or 6063-T5.
   1. Frame: 5" deep channel, .081" thick
   2. Blades: Vertical .081" thick

B. Thread Fasteners: Screws, bolts, nut and washers shall be Stainless steel.

1. Corner assembly fasteners shall be #10-16 x stainless steel TEK screws. Length as required to develop full holding capacity of screw when fastened to Mechanical Equipment.
2. Provide lock washer or other locking device at bolted connections.

2.3 FABRICATION

A. Provide factory-formed panel systems with continuous interlocking panel connections. Form components true to shape, accurate in size, square and free from distortion or defects. Cut panels to precise lengths indicated on approved shop drawings.
   1. Panel Style and Height: Vertical System, height to match equipment.
   2. Finish: Mill.

B. Trim and Closures: Fabricated from 24 gage metal, and finished with the manufacturer's standard coating system.
   1. Top Trim: Flat

C. Framing: Fabricate and assemble components in largest practical sizes, for delivery to the site.
   1. Construct corner assemblies to required shape with joints tightly fitted.
   2. Supply components required for anchorage of framing. Fabricate anchors and related components of material and finish as required, or as specifically noted.

2.4 FINISHES

A. Aluminum Framing: Mill.

B. Panel Coating: Manufacturer's standard coating system, factory-applied. Color shall be as selected by Architect from manufacturer's complete color line.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine conditions under which construction activities of this section are to be performed. Submit written notification to Architect if such conditions are unacceptable. Beginning erection constitutes installer's acceptance of conditions.

3.2 INSTALLATION

A. Install units in accordance with the manufacturer's written instructions and recommendations. Keep perimeter lines straight, plumb, and level. Provide brackets, anchors, and accessories necessary for a complete installation.

B. Fasten structural supports to HVAC units without damaging operation of the unit.
   1. Provide corner and mid-span assemblies as required by approved shop drawings so that the panels are supported uniformly.
   2. Fastening bottom rail using bolts to permit ease of access to HVAC units.

C. Insert panels into structural supports, except where fixed attachment points are indicated. Butt panels to adjacent panels for uniform fit. Fasten fixed panels in accordance with the shop drawings.

D. Metal Separation: Where aluminum materials would contact dissimilar materials, insert rubber grommets at attachment points, thus eliminating where dissimilar metals would otherwise be in contact.

E. Do not cut or abrade finishes which cannot be restored. Return items with such finishes to shop for required alterations.

3.3 ERECTION TOLERANCES

A. Maximum misalignment from true position: 1/4".

3.4 CLEANING AND PROTECTION

A. Remove protective masking from material immediately after installation.

B. Protection:
   1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
   2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.

C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.
   1. Clean units in accordance with the manufacturer's instructions.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 10 99 00

MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl Adhesive Graphics at Concrete Masonry and perforated digital adhesive graphic for glazing.

SUBMITTALS

B. General: Submit following items in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

C. Product Data: Include complete manufacturer's catalog cuts and data sheets, complete parts list, installation requirements, and all pertinent performance characteristics and criteria.

D. Shop Drawings: Indicate materials, construction, sizes, quantities, finishes, mounting attachments, and installation details.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of product, with not less than 5 years of experience.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

1.4 WARRANTY

A. Provide a 3-year manufacturer’s warranty for the vinyl adhesive floor graphics.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Adhesive Graphics at Concrete Masonry: Provide (Print) 3M Envision Print Wrap Film LX480Cv3 with Protective Layers of 3M Envision 8549L Luster Wrap Overlaminate. Provide graphics in design as provided by Architect.
Jessup Adhesive Coated Film (phone 888.711.7735)
MDC Interior Solutions (800.621.4006)
Redsmith (210.308.0222)
Thomas Printworks (800.877.3776)

B. Custom Perforated Digital Adhesive Graphic for Glazing: Basis of Design provide MDC Interior Solutions perforated vinyl adhesive graphics in design as provided by the Architect to integrate with Custom Digital Wallcovering. The following are acceptable manufacturers provided they can match custom digital wallcovering:
MDC Interior Solutions (800.621.4006)
Redsmith (210.308.0222)

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrate surfaces as recommended by manufacturer.

3.2 EXAMINATION

A. Verify that surfaces and conditions are ready to receive work of this Section.

B. Notify Architect of any existing conditions which will adversely affect execution.

C. Beginning of execution will constitute acceptance of existing conditions.

3.3 INSTALLATION

A. Vinyl Wall Graphics at Concrete Masonry: Vinyl Graphics shall be applied using a foam roller and heat gun per 3M recommendations.

B. Perforated Digital Adhesive Graphic for Glazing: Install in strict compliance with manufacturer's written instructions and recommendations. Test for proper adherence to floor and repair or replace until required results are obtained.

3.4 ADJUSTING

A. Adjust and fit items to be flush with adjacent construction.

B. Fasten or adhere for tight connections and joints.

3.5 PROTECTION

A. Protect the completed work from damage.

B. Replace damaged items which cannot be repaired.

C. Protect finished installation in accordance with SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

3.6 CLEANING

A. Upon completion of the building, clean area. Leave products free of defects and in ready-to-use condition.

B. Perform final cleaning in accordance with SECTION 01 74 13 - PROGRESS CLEANING.

END OF SECTION

SECTION 11 31 00

APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Appliances.

B. Related Sections:
1. Section 06 40 00 - Architectural Woodwork: millwork.
2. Section 12 32 16 - Manufactured Plastic-laminate-clad Casework
3. Division 22 - Plumbing: plumbing rough-in.
4. Division 26 - Electrical: electrical rough-in.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Product Data: Include list of optional features, operating characteristics, and dimensions of individual appliances.

C. Operating and Maintenance Manuals: Provide per SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA.

D. Shop Drawings: Submit rough-in drawings showing dimensioned locations of electrical and plumbing stub-outs for appliances.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Provide electrical components required as part of appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

B. Accessibility Standards: Where appliances are required to comply with accessibility requirements, comply with Texas Accessibility Standards (TAS).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Appliances shall be of the quality manufactured by Whirlpool Corp. and U-Line Corp. and are listed by Whirlpool and U-Line catalog numbers for convenience in identification. The use of a catalog number as a description of an item shall be taken to include the description or specification for the item in the manufacturer's catalog. Equivalent items of the following manufacturers are acceptable:
Hotpoint
GE Appliances
KitchenAid
Maytag

2.2 EQUIPMENT

A. Ice Makers: Commercial Machine with Storage Bin: Provide crescent cube, Hoshizaki KM-901MAJ on B-500 Storage Bin, 208V, air-cooled, remote condenser with line set for connection of machine to condenser.

B. Cold-Tank Hydrotherapy Whirlpools:
1. Cold-Tank Hydrotherapy Whirlpool: Provide Model 6204 CRYTherm ReadyFit, 438 gallon max capacity stationary whirlpool as manufactured by Grimm Scientific.
2. Cold-Tank Hydrotherapy Whirlpool: Provide Model 6206 CRYTherm ReadyFit, 656 gallon max capacity stationary whirlpool as manufactured by Grimm Scientific.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

B. Freestanding Appliances: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate appliances.

3.3 CLEANING AND PROTECTION

A. Test each item of appliances to verify proper operation. Make necessary adjustments. Verify that accessories required have been furnished and installed.

B. Remove packing material from appliances and leave units in clean condition, ready for operation.

C. Protection: Protect the completed work from damage.

END OF SECTION

SECTION 11 66 00

ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Athletic equipment.

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include manufacturer's specifications, anchor details, and installation instructions for products.

C. Shop Drawings: Include drawings for fabrication and erection of equipment assemblies which are not fully described in manufacturer's data.

1.3 QUALITY ASSURANCE

A. The entire backstop structure shall conform to the current FIBA/NCAA rules and regulations governing basketball in force at time of installation.

1.4 WARRANTY

A. Provide Manufacturer’s Lifetime Warranty against breakage of backboard.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design Products as manufactured by Porter Athletic Equipment Co. Provide athletic equipment as manufactured by one of the following:
Draper Shade & Screen Co., Inc.
Performance Sports Systems, Inc.
Porter Athletic Equipment Co.

2.2 WALL PADS

A. Provide wall pads as manufactured by Porter Athletic Equipment Co. Vinyl covering shall be flame retardant and comply with UL-214. Vinyl covering shall be as selected by Architect from one of manufacturer's fourteen (14) standard colors. Furnish all framing and associated hardware for complete and rigid installation.
1. Panels: No. 00560-0XX, panels shall be constructed of 2" Rebonded Foam, height and length as scheduled in “Material Finish Schedule” in drawings and cemented to 7/16" oriented strand board backing covered with flame retardant, vinyl coating fabric folded and stapled securely to back of oriented strand board. A 1" nailing margin shall be provided at top and bottom for securing panels to the wall.
2. “L” Shaped Panels: No. 90206026xx, panels shall be constructed in an “L” shape of 2" Rebonded Foam, height and length as scheduled in “Material Finish Schedule” in drawings and cemented to 7/16" oriented strand board backing covered with flame retardant, vinyl coating fabric folded and stapled securely to back of oriented strand board. A 1" nailing margin shall be provided at top and bottom for securing panels to the wall.

2.3 WHIRLPOOLS

A. Whirlpools:
1. Whirlpool: Provide “Model 6206 CRYOTherm ReadyFit Hydrotherapy Console” as manufactured by Grimm Scientific with dual speed pump, automatic water level control, self-contained energy efficient

refrigeration and electronic digital display. Tank is 108” long, 54” wide, and 28” deep with a capacity of 656 gallons. It is formed and welded from heavy gauge Type 304 stainless steel.

2. Whirlpool: Provide “Model 6204 CRYOTherm ReadyFit Cold-Tank Hydrothereapy Console” as manufactured by Grimm Scientific with dual speed pump, automatic water level control, self-contained energy efficient refrigeration and electronic digital display. Tank is 72” long, 54” wide, and 28” deep with a capacity of 438 gallons. It is formed and welded from heavy gauge Type 304 stainless steel.

2.4 INDOOR FOOTBALL GOAL NETTING AND BUILDING PROTECTIVE NETTING

A. Indoor Football Goal Netting:
   1. Netting shall be custom made with #504 square netting or optional product of Gilman Gear.
   2. Yellow vinyl goal post straps shall be sewn into netting.
   3. Vinyl pocket on bottom to accent weighted and attachment tube.
   4. Vinyl/grommets sewn on top for uni-strut attachment to z-purlins.
   5. Each edge piece shall be hemmed with a 5/16" three strand twisted poly rope spliced to the edge. Accessories shall include corner reinforcing plates and steel cable support.

B. Building Protective Netting:
   1. Netting: #36 x 1 ¾” High tenacity twisted black Dyneema square mesh barrier netting.
   2. Border: 3/8” black Dacron polyester rope border. 3,000 lbs tensile strength min.
   3. Hanging: Aircraft cable or #36 round black nylon braid, 340 lbs tensile strength min. attached to aircraft cable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install athletic equipment and accessories in accord with the manufacturer's written instructions and recommendations.
   1. Locate equipment accurately and install to be rigid and secure.

3.2 ADJUSTING

A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

3.3 CLEANING AND PROTECTION

A. After completing athletic equipment installation, inspect components. Remove spots, dirt, and debris and tough up damaged shop-applied finishes according to manufacturer’s written instructions.

B. Provide final protection and maintain conditions acceptable to manufacturer and installer that ensure athletic equipment is without damage or deterioration at time of substantial completion.

C. Replace athletic equipment and finishes that cannot be cleaned and repaired, in a manner acceptable to Architect, before time of substantial completion.

END OF SECTION

SECTION 12 21 13

HORIZONTAL BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Horizontal blinds.

B. Related Sections:
1. Section 08 11 00 - Hollow Metal Doors and Frames; glazed openings.
2. Section 08 41 13 - Aluminum-framed Entrances and Storefronts.

1.2 SYSTEM DESCRIPTION

A. Horizontal metal slat louver blinds installed at storefront, curtain wall, glazed openings, and mirrors manual control of raising and lowering by cord; blade angle adjustable by control wand. Horizontal blinds shall be Indicated as "HB" on the drawings.

1.3 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include manufacturer's catalog cuts and data sheets, and installation instructions and data certifying blinds are lead-free.

C. Shop Drawings: Include details of attachment and schedule of each size and location.

1.4 QUALITY ASSURANCE

A. Measurements: Provide custom size blinds for the openings or mirrors in which they are to be installed. Take careful measurements of each opening so that the blinds will fit properly. Plan dimensions shall not be used. Verify head, jamb, and sill conditions.

B. All blinds shall be lead-free.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS.

B. Deliver blinds wrapped and crated in a manner to prevent damage to components or marring of surfaces.

C. Store and protect products under provisions of SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS.

D. Store in a clean, dry area, laid flat and blocked off ground to prevent sagging, twisting, or warping.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Horizontal Blinds:
1. Product/manufacturer; one of the following or approved equivalent:
Classics 1” Cordless Mini Blinds; SWF Contract
Levolor 1" (25mm) Riviera Classic Cordless Blind; Levolor Corp.
2. 1" wide by 0.0085" thick slat type
3. Valance for each blind.
4. All blinds shall be the cordless type.
5. Blinds are provided for installation “within” storefront. When installed on “face” of storefront, with Architect approval, provide Hidden Brackets with Endcaps.

2.2 MATERIALS AND FABRICATION

A. Horizontal Blinds:
1. Head channel shall be 0.025" thick Tomized steel with a plastic type coating. Channel shall be "U" shaped, approximately 1" high x 1-1/2" wide, with flanged edges at the top. When installed on “face” of storefront, with Architect approval, provide Hidden Brackets with Endcaps.
2. Drum and cradles shall be low-friction thermoplastic and provided for each ladder.
3. Disengaging clutch and crash-proof lock.
4. Slat supports shall be braided of polyester yarn. The vertical component shall have a diameter of not less than 0.045" nor greater than 0.066". Braiding shall be accurate to hold slats equally spaced, parallel and straight, and to assure proper tilt control and adequate overlay of slats. Provide 31 rungs per 2 feet of ladder, equally spaced. Distance between ladders shall not exceed 21". The horizontal component shall consist of not less than four cables interbraided with the vertical component.
5. Slats shall be virgin aluminum alloy approximately 1" wide by 0.0085" thick. Slats shall have sufficient crown to prevent sagging and radius corners.
6. Bottom rail shall be 0.025" thick Tomized steel with a plastic type coating.
7. Tilter shall be Tomized steel of enclosed construction. Unit shall tilt the slats to any desired angle and hold them at that angle. An automatic disengagement of worm and gear shall eliminate overdrive to prevent strain or damage to wand, worm, gear, ladder or top slat. Operation shall be by wand of sufficient length and swivel for easy operation.
8. Finish: The factory finish for the exposed surfaces shall be a plastic type finish coat baked on. Color shall be as selected by Architect from manufacturer's standard color range.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive blinds for conditions which will adversely affect the installation of the blinds. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Attach installation end brackets at each end of blind location. For blinds over 55" long or over 50 square feet in area, provide intermediate brackets.

B. Blinds shall be mounted in brackets inside frame jambs by skilled mechanics under the supervision of an authorized representative of the manufacturer. The completed blinds shall be left clean and in perfect working order. Crates, cartons, and rubbish shall be removed from the premises; rooms shall be left broom clean.

3.3 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4".

B. Maximum Offset From Level: 1/8".

3.4 ADJUSTING

A. Adjust work under provisions of SECTION 01 77 00 - CLOSEOUT PROCEDURES.

B. Adjust blinds for smooth operation.

3.5 CLEANING

A. Clean work under provisions of SECTION 01 74 13 - PROGRESS CLEANING.

END OF SECTION

SECTION 12 32 00

MANUFACTURED CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cabinet units.
2. Countertops.
3. Hardware.
4. Factory integrated components.
5. Site integrated components.

B. Related Requirements:
1. 01 31 19 - Project Meetings: for additional requirements of preinstallation meeting.
2. 01 45 00 - Quality Control: for additional requirements related to Quality Requirements and testing.
3. 02 41 19 - Selective Structure Demolition - Limitations on disposal of removed materials; requirements for recycling.

1.2 DEFINITIONS

A. Factory Integrated Components: Materials or components specified in other sections for factory assembly within manufactured casework.

B. Site Integrated Components: Materials or components specified in other sections for site assembly within manufactured casework.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene before starting installation work of this section in accordance with
1. Attendees: Owner’s representative, Architect, Contractor, and all Subcontractors interfacing with manufactured casework.
2. Review preparation, sequencing and installation procedures of the manufactured casework to coordinate the work of this section with other impacted sections.

1.4 SUBMITTALS

A. Submit the following in accordance with section SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittals must be reviewed and approved by the Contractor before sending to the Architect for review.

C. Sample: Submit two samples for verification of selected finish as scheduled upon request unless noted otherwise. All wood veneer and non-standard custom finishes must be reviewed and approved by the Architect.
1. Anodized: 3 x 6 inch (76mm x 153mm) on metal.
2. Chroma Coat:
   a. Standard Color: 2 x 2 inch (51mm x 51mm) paint chip.
   b. Custom Color: 4 x 6 (102mm x 153mm) inch on MDF.
3. Powder Coat: 2 x 4 inch (51mm x 102mm) on metal.
4. Thermofoil: As provided by thermofoil manufacturer.

D. Product Data: Provide manufacturers standard tech sheets as applicable to the project for hardware, accessories and integrated components.

E. Pre-Manufacture Submittal: Provide the following information to the manufacturer prior to development of shop drawings.
   1. Field measurements of existing construction, future construction, finished width and height of walls and associated components, as well as design team provided plans, elevations and schedules.
      a. Where field measurements are not possible, hold-to and control dimensions must be coordinated and agreed upon by all parties who interface with the manufactured casework through the Shop Drawing process before manufacturing begins.
   2. Casework and Countertops: Include finishes, dimensions and layouts.
   3. Factory Integrated Components: Provide make, model, size, configuration, materials and any additional pertinent product data for factory assembly.
   4. Site Integrated Components: Provide make, model, size, configuration and any additional pertinent product data for site installation.

F. Shop Drawings: Submit shop drawings for review prior to commencing any fabrication of the manufactured casework. Coordinate as required until scope is confirmed by all affected stakeholders. Include manufacturer provided plans, elevations, isometric drawings, connection and attachment methods, and finish schedule.
   1. Prior to shop drawing submittal review the drawings for obvious drafting and detailing errors.
   2. Indicate finishes, component profiles, dimensions of individual components, mounting types, hardware and accessories.
   3. Indicate locations of integrated components.

G. Manufacturer's Installation Instructions: Indicate any special preparation of base building conditions, installation and attachment methods.

H. Operation and Maintenance Data: Provide maintenance data for incorporation into operation and maintenance manuals.

I. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section, of the quality and complexity required for this project for a minimum 9 years. Show production facilities capable of meeting contract requirements for single-source responsibilities and warranty.
   2. Installer Qualifications: Company specializing in performing the work of this section with minimum of 2 years of experience.

B. Source Limitations: Obtain products specified herein from a single source.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver or install manufactured casework until spaces are enclosed and weather-tight, wet work is complete and dry, work above ceilings is substantially complete, and HVAC system is operational and able to maintain ambient temperature and humidity conditions between 60 and 90 degrees Fahrenheit (15.5 and 32.2 Celsius) with Relative Humidity maintained between 25 and 55 percent.

B. Do not allow packaging to get wet or develop condensation.

C. Store in a clean, dry, secure area to protect from damage. Minimize or eliminate storage prior to install by coordinating delivery with construction schedule.

D. Comply with the manufacturer’s requirements for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.7 WARRANTY

A. Manufacturer Warranty: Provide 10 year warranty on manufactured casework for failures in materials or workmanship as indicated by the manufacturer standard warranty.

B. Integrated LED Warranty by component manufacturer: Provide 3 year warranty for failures in materials or workmanship as indicated by the manufacturer standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Specification is based on products listed below by DIRTT Environmental Solutions.
   1. Substitutions for products by manufacturers other than those listed above shall be submitted for review in accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 DESCRIPTION

A. Custom designed, frameless casework and countertops made of Medium Density Fiberboard clad with manufacturers factory finishes and associated accessories, hardware and integrated components.

2.3 PERFORMANCE AND DESIGN CRITERIA

A. Provide manufactured casework that is factory finished on all surfaces.

B. Provide cabinet units including base cabinets capable of being wall hung to provide a clear open space between the bottom of the cabinet unit and the finished floor.

2.4 CABINET UNITS

A. Configurations and Dimensions: As indicated on Drawings.

B. Core Material: Medium Density Fiberboard Core (MDF).
   1. Features:
      a. No Added Formaldehyde MDF.
   2. Thickness:
      a. Cabinet Sides, Door and Drawer Fronts: 3/4 inch (19 mm).
      b. Drawer Bodies: 5/8 inch (16 mm).
         1) Low profile drawer features:
            a) Manufacturers standard metal sides painted [white] [black].

C. Edges: Unless noted otherwise, Self-Edge to match specified finish with minimal visible seaming.

D. Finish Materials: Manufacturer shall provide the following standard options. See Finish Schedule below for additional information.
   1. Thermofoil: 3D laminate film vacuum formed to substrate.
   2. Doors and Drawers Features:

E. Interior and non-visible finishes: Type based upon exterior visible finish.
   1. Manufacturer’s standard Low Pressure Laminate (LPL) at Thermofoil panels.
      a. Color: White or Black
   2. Chroma Coat on all sides and edges at Chroma Coat panels.
   3. Wood veneer on all sides and edges at wood veneer panels.
   4. Drawers: Manufacturer’s standard LPL.
      a. Color: White or Black

F. Toe Kick: Manufacturer standard un-finished plywood base frame with integrated leveling hardware for floor mounted base cabinet units.
   1. Material: Manufacturer standard plywood.
   2. Thickness: 3/4 inch (19 mm).
   3. Height: As indicated on drawings.
      a. Minimum: 2-1/2 inch (64mm).
      b. Maximum: 9 inch (229mm).
   4. Finish: Mechanically fastened MDF with finish indicated on drawings

2.5 COUNTERTOPS

A. Finish Materials: Manufacturer shall provide the following standard options. See Finish Schedule below for additional information.

B. Thermofoil: 3D laminate film vacuum formed to substrate.
   1. Core Material: Medium Density Fiberboard Core (MDF).
      a. Features:
         1) No Added Formaldehyde MDF.
   2. Thickness: 1 inch (25mm).
   3. Edges: Unless noted otherwise, Self-Edge to match specified finish with minimal visible seaming.
   4. Interior and non-visible finishes: Manufacturer's standard wood fiber veneer unless otherwise indicated on Shop Drawings.
      a. Color: Brown
   5. Back and End Splashes: Same core and finish material.
      a. Profile: Square top.
      b. Height: Minimum 4 inch (102mm).
      c. Thickness: 3/4 inch (19mm).

2.6 HARDWARE

A. General: All manufactured casework hardware located as indicated by shop drawings.

B. Door Hinges:
   1. Type: Manufacturer standard 107 degree full overlay.
      a. Features: Soft close.

C. Drawer and Door Pulls:
   1. Rod Pull: Manufacturer standard
      a. Length: 6-1/8 inch (156mm)
      b. Finish: Brushed Nickle

D. Drawer Slides:
   1. Type: Slide for LPL Drawer Box.
      a. Manufacturer and Model #: Tandem 560H
      b. Weight Capacity: Rated for 66 lbs (30kg).
      c. Features:
         1) Undermount.
         2) Full extension.
         3) Self-close, stay closed.
      d. Finish: Zinc
   2. Type: Slide for low profile drawer box.
      a. Manufacturer standard formed metal rail.
      b. Weight Capacity: Rated for 100 lbs (45.36kg).
      c. Features:
         1) Undermount.
         2) Full extension.
         3) Self-close, stay closed.

E. Locks:
   1. Type: Keyed
      a. Manufacturer Standard
   2. Type: Keyless
      a. Manufacturer and Part #: StealthLock SL-100
      b. Features: Concealed, Programmable, RF Remote Controlled
      c. Notes: As indicated on drawings

2.7 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

B. Integrated recessed LED luminaire:
   1. Wiring: Manufacturer provided cable with NEMA 1-15P (non-polarized) 45° low profile plug for every 12 continuous linear feet (3.65m) of luminaire.
   2. Driver/Power Supply: One 12V constant, 0-40W "Power Pack" for every 12 continuous linear feet (3.65m).
   3. Color Temperature: [Warm (3000K)] [Cool (4000K)].
   4. Switch Type: [Touchless Sensor] [Push Button].

C. Integrated USB power: Manufacturer standard USB docking station for charging devices within drawers.
   1. Number of Ports: 4
   2. Finish: White
   3. Dimensions: 2-1/2 inches (64mm) x 7-3/16 inches (182mm)
   4. Features: Integrated switch/circuit breaker
   5. Power Source: Provided in accordance with division 26 Electrical requirements.

D. File Bars: Manufacturers standard integrated aluminum flat bar hanging file rail.
   1. Orientation: [Left to Right] [Front to Back]
   2. Paper Size: Letter, 8-1/2 x 11 inches (216 x 279mm).
   3. Finish: Manufacturers standard “Shimmer” color powder coat. See finish schedule below.

E. Grommet: Manufacturers standard plastic grommet for cabling.
   1. Color: Black.
   2. Diameter: 3 inch (76mm).

F. Waste Bin: Manufacturers standard metal container with plastic lid.
   1. Finish: Manufacturers standard white

2.8 FABRICATION

A. Cabinet Units:
   1. Cabinet units shall be factory assembled with concealed fasteners at panel to panel connections.
   2. Cabinet units shall have no raw unfinished surfaces and all surfaces shall be factory finished.

B. Countertops:
   1. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   2. Join lengths of tops using best method recommended by manufacturer.
   3. Fabricate fronts and ends of cabinets with a minimum 1/2 inch overhang except where top butts against cabinet or wall.
   4. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
   5. Finish all visible and non-visible surfaces with manufacturer standard finishes suitable for the application of the countertop.
   6. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.
   7. Solid Surfacing: Fabricate up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

C. Back or Side Splash: Provide back or side splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and secure finish surfaces with a waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

B. Examine all adjoining work including work by others.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

B. Locations to receive manufactured casework shall be inspected for compliance with manufacturers requirements.

C. Field conditions and pre-existing installations by others which may adversely affect installation or exceed the manufacturers limitations shall be corrected before installing manufactured casework.

3.3 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present and pre-installation meeting.

B. Install toe kicks in locations as indicated by drawings and adjust levelers in preparation of base cabinet units.

C. Install base cabinet units on top of manufacturer provided toe kicks per shop drawings.

D. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

E. Seal joint between back or side splashes and vertical surfaces.

F. Manufacturer provided drawer pulls ship mounted to inside of cabinet unit. Installer to remove and install in final position per shop drawings.

3.4 TOLERANCES

A. Variation From Horizontal, cabinet units and countertops: 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

3.5 ADJUSTING

A. Adjust and lubricate hardware for proper operation in accordance with manufacturer’s instructions.

3.6 CLEANING

A. Dispose of all waste material in accordance with SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION and project's Waste Management Plan.

B. Upon completion of installation clean finishes in accordance with the manufacturer’s instructions. Avoid alkaline or abrasive agents. Avoid scratching or marring finishes.

3.7 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, warranty, and to avoid scratching or marring of finishes.

3.8 FINISH SCHEDULE

A. (ANO-1) Anodized:
   1. Type: Manufacturer Standard AAMA 611, AAM12C22A31, Class I
   2. Color: Clear.

B. (THRM-1) Thermofoil:
   1. Type: Manufacturer Standard
   2. Color Name: Merapi.
   3. Grain Direction: Horizontal
   4. Notes: As indicated on drawings.

C. (THRM-2) Thermofoil:
   1. Type: Manufacturer Standard
   2. Color Name: Canadian Grey Super Matte.
   3. Grain Direction: Horizontal
   4. Notes: As indicated on drawings.

D. (PWD-1): Powder Coat
   1. Type: Manufacturer Standard.
   2. Texture: Textured
   3. Color Manufacturer: DIRTT.
   4. Color Name: Black.
   5. Notes: As indicated on drawings.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 13 34 19

METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pre-engineered building system including the structural steel system primary and secondary per Design Criteria, metal roof system, canopy, wall system and all roof and wall insulation, trim and accessories as required.

B. Related Sections:
1. Section 03 30 00 - Cast-in-place Concrete
2. Section 05 50 00 - Metal Fabrications; structural frames for overhead doors
3. Section 08 33 23 - Overhead Coiling Doors
4. Section 08 36 13 - Sectional Overhead Doors
5. Section 08 41 13 - Aluminum Framed Entrances and Storefronts
6. Section 09 91 00 - Painting; field painting exposed structure
7. Division 21 - Fire Suppression; piping and supports
8. Division 22 - Plumbing; piping and supports
9. Division 23 - Heating, Ventilating, and Air Conditioning (HVAC); ductwork and supports
10. Section 31 23 00 - Excavation and Fill
11. Section 31 63 29 - Drilled Concrete Piers

1.2 SUBMITTALS

A. Shop Drawings: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Include complete erection drawings showing anchor bolt sizing, patterns and embedment lengths from datum, sidewall, endwall and roof framing, transverse cross sections, panel layout, flashing and trim details, and foundation loads.

B. Samples: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit a 12" long by actual width sample of roofing and siding panels, with required finish.

C. Letter of Certification: Submit written Certification prepared and signed by a Professional Engineer, registered to practice in the State of Texas, verifying that building design and metal roof system (including panels, clips and support system components) meet indicated loading requirements and codes of authorities having jurisdiction. The certification must reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end use categories, governing code bodies including year and load applications.

D. Welders Certification: Provide copy of welder's certification. Welders must show proof of certification/ qualification prior to starting any welding on the project.

1.3 QUALITY ASSURANCE

A. Design Criteria:
1. Design of metal building systems shall be based upon both strength and deflection requirements. These requirements shall meet the more stringent of the 2021 IBC or the criteria listed herein.
2. Structural Framing: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturer's Association's (MBMA) "Design Practices Manual" and applicable Building Code.
3. Structural Steel: Comply with the requirements of the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.
4. Light Gage Steel: Comply with the requirements of the American Iron and Steel Institute's (AISI) "Specifications for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
5. Welders must show proof of certification/qualification prior to starting any welding on the project. For welded connections, comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures. Welding procedure and operator qualifications and welding quality standard shall be in accordance with the American Welding Society structural welding code.

Inspection other than visual inspection as defined by AWS, Paragraph 8.15.1, shall be identified and negotiated prior to bidding.

6. Roof Live Load = 20 psf with code-allowable area reductions.
7. Total Roof Dead Load and Collateral Load = as required by materials shown on Architectural and MEP set plus frame weight.
8. Roof purlins shall be capable of supporting concentrated loads such as mechanical loads, sprinkler loads, sectional overhead doors.
9. Wind Load = 146 mph, Exposure C.
10. Building Drift = Limited to H/400 at masonry.
11. Metal roof panels shall not provide a diaphragm or lateral stability for purlins.
12. Roof Panel System shall meet UL Class 90 uplift requirements.
13. The General Contractor is responsible for obtaining and installing the building frame anchor bolts. The manufacturer shall provide design loads and/or the anchor bolt size required. The General Contractor shall verify the anchor bolt lengths do not extend beyond the concrete foundation dimensions. The General Contractor shall verify that all bids meet the above minimum design criteria, including the requirements for Collateral Load of 5 psf.

B. Certain characteristics as dimensioned, detailed and specified shall not vary, including:
   1. Roof decking and insulation systems.
   2. Wall enclosure systems, insulation, etc. Including locations and sizes of openings, etc.
   3. Column locations, except to reduce quantity of columns.
   4. Primary frame locations and spacing.
   5. Secondary frame spacing (purlins, girts, etc.), except to reduce dimensions.
   6. Shape or gauge of exposed sheet metal gutters, fascia, flashing, etc.
   7. Roof slope or direction of slope.
   8. Bracing of interior drywall and masonry partitions to roof structure.
   9. Provide straight columns to a height of 20’-0” A.F.F. before tapering.

C. Certain characteristics as dimensioned, detailed and specified shall be allowed to vary to accommodate alternate framing, including:
   1. Member sizes, except where clearances with scheduled ceiling heights, ductwork and piping, etc., as designed, create conflicts.
   2. Concealed portions of flashings, except as required to maintain watertightness and system integrity.
   3. Bracing methods, except where architectural elements create conflicts. Minor adjustments may be made by the Architect to accommodate bracing requirements.

D. Installation of the pre-engineered building system shall be performed by one of the following:
   1. Authorized builder or contractor of the manufacturer having a minimum of 5 years’ experience in installations of this type.
   2. Contractor authorized by the manufacturer as trained and qualified to erect the manufacturer's product and have a minimum of 5 years’ experience in installations of this type.

E. Manufacturer's Qualifications:
   1. Provide pre-engineered metal buildings as produced by a manufacturer with not less than 10 years successful experience in the fabrication of pre-engineered metal buildings of the type and quality required.
   2. IAS accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems", as set forth in the International Building Code, Section 1704.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver preformed metal roofing panels and trim items to the project site with no dents, scratches, or abraded areas. Deliver in manufacturer's standard bundles, securely bound and store at the project site raised above slab or ground level on pallets.

1.5 WARRANTY

A. Special Project Warranty: Submit two executed copies of standard 2-year "Roofing Guarantee" on form included at the end of this section, covering work of this section, including roofing panels, trim, sheet metal flashing, roof insulation and roofing accessories, signed by installer (roofer).

B. Furnish to the Owner written 20-year warranties for the following:
   1. 20-year material failure warranty covering the cost of material and labor to repair, repaint, or replace materials not to exceed $.80/SF for the aggregate of all claims.

2. 20-year weathertightness warranty to repair or stop any leaks not to exceed $.50/SF for the aggregate of all claims.
3. The warranty dollar limits noted in items 1. and 2. above, shall be additive so that the aggregate value of the dollar limit of all claims shall not exceed $1.30/SF.
4. 20-year warranty that coating shall not blister, peel, crack, chip or experience material rust-through for 20 years. For a period of 20 years, chalking shall not exceed #8-ASTM and fading shall be 5 ΔE Color Difference Units or less.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS/MANUFACTURERS

A. Basis of Design shall be Butler Manufacturing Co. Provide pre-engineered building as manufactured by one of the following:
   Alliance Seam 24 -AS24 Panel/PBR Panel; Alliance Steel
   (phone 800.624.1579 web site: www.allianceokc.com)
   MR 24 Roof Panels/BR II Wall Panels; Butler Manufacturing Co.
   (phone 816.968.3304 web site: www.butlermfg.com)
   Starshield Standing Seam Roof Panels/Dura-Rib Wall Panels; Star Manufacturing Co.
   (phone 800.879.7827 web site: www.starbldg.com)
   SSR Roof Panels/VP Panel Rib Wall Panels; VP Buildings, Inc.
   (phone 800.238.3246 web site: www.vp.com)
   RedDot Buildings
   (www.reddotbuildings.com)

2.2 MATERIALS: STRUCTURAL FRAMING SYSTEM

A. Structural Steel Design:
   1. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."
   2. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
   3. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses
   4. The structural system will be designed in accordance with a specified building code. (Refer to Design Loads and Building Codes).
   5. Anchor bolts shall be designed using loads provided by manufacturer.

B. Primary Framing:
   1. Rigid Frames
      a. Frames shall consist of welded-up plate section columns and roof beams complete with necessary splice plates for bolted field assembly.
         1) All base plates, cap plates, compression splice plates and stiffener plates shall be factory welded into place and have the connection holes shop fabricated.
         2) Columns and roof beams shall be fabricated complete with holes in webs and flanges for the attachment of secondary structural members and bracing except for field work as noted on manufacturer's erection drawings.
      b. All bolts for field assembly of frame members shall be high strength bolts as indicated on erection drawings.
      c. Provide straight columns to a height of 20’-0” A.F.F. before tapering.
   2. Endwall Structurals:
      a. The endwall structurals shall be cold-formed channel members designed in accordance with the 1986 AISI Specification or welded-up plate sections designed in accordance with the 1989 AISC Specification.
      b. Endwall frames shall consist of endwall corner posts, endwall roof beams and endwall posts as required by design criteria.
         1) All splice plates and base clips shall be shop fabricated complete with bolt connection holes. All base plates, cap plates, compression splice plates and stiffener plates shall be factory welded into place and have the connection holes shop fabricated.
         2) Beams and posts shall be shop fabricated complete with holes for the attachment of secondary structural members except for field work as noted on manufacturer's erection drawings.
      c. Intermediate frames shall be substituted for endwall roof beams when specified.
         1) Necessary endwall posts and holes for connection to the intermediate frame used in the endwall shall be shop fabricated.

C. Secondary Structural Members:

1. Purlins and Girts
   a. Purlins and girts shall be "Z" shaped, precision roll formed.
2. Eave Struts: "C" sections.
3. Bracing
   a. Bracing shall be located as indicated on drawings.
   b. Diagonal bracing shall be hot-rolled rod of size indicated on drawings, and attached to columns and roof beams as shown on the drawings.
   c. Optional fixed base wind posts or pinned base portal frames may be substituted for wall rod bracing on buildings as required.
   d. Flange braces, purlin braces, etc., when required, shall be cold-formed and installed as indicated on drawings. In finished spaces, no flange braces for columns or purlins may be located below ceiling height.

D. Finish: Factory Primed Structural Painting
1. General:
   a. Apply specified primer immediately after cleaning and pretreating.
   b. All structural steel shall be prime painted as temporary protection against ordinary atmospheric conditions. Subsequent finish, painting, if required, shall be performed in the field by others.
   c. Prior to painting all steel shall be cleaned of loose rust, loose mill scale, dirt and other foreign material. Unless otherwise specified the fabricator shall not sand-blast, flame clean or pickle prior to painting.
   d. Factory cover all steel with one coat of red oxide primer paint formulated to equal or exceed the performance requirements of Federal Specification TT-P-636D, TT-P-664C and SSPC Paint-25.
2. Primary Frames:
   a. Clean all steel per SSPC-SP2.
   b. Apply one coat of water reducible alkyd primer by spray or dip method to a minimum coating thickness of 1.0 mil.
3. Secondary Structural Members:
   a. Clean all steel per SSPC-SP8.
   b. Apply one coat of coil applied polyester primer to a minimum coating thickness of 0.5 mil. (purlins and girts).

E. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 to meet requirements of ASTM A780.

2.3 MATERIALS - WALL PANELS

A. Refer to SECTION 07 42 13.00 - METAL WALL PANELS
   Finish: Finish with exterior colors as scheduled in “Material Finish Schedule” in drawings, a full strength, 70% Kynar® 500/Hylar 5000™ fluoropolymer coating. Manufacturer warrants that coating shall not blister, peel, crack, chip, or experience material rust-through for 20 years. For a period of 20 years chalking shall not exceed #8 - ASTM and fading shall be 5ΔE Color Difference Units or less.

B. Trim material should be as follows:
1. Exterior trim shall be of the same color as the exterior color of the wall panel except the following:
   a. Eave trim, gable trim, door side flashings and header flashings to be galvanized prepainted steel with, a full strength, 70% Kynar® 500/Hylar 5000™ fluoropolymer coating.
   b. Downspouts and gutters shall be 24 gauge preprimed galvanized steel ready for field painting.
   c. Interior trim shall be painted.
   d. Flashings, trims, closures and similar items shall be as detailed on drawings as supplied by the manufacturer of the panel.

C. Fasteners:
1. Wall panel-to-structural connections shall be made with Torx® head Scrubolt™ fasteners, Torx® head self-drilling screws or Lock-Rivet™ fasteners. Panel-to-panel connections shall be made with Torx® head self-drilling screws, or Lock-Rivets.
2. Lock-Rivets (optional) shall be set by a special Lock-Rivet tool.
3. Fastener locations shall be as shown on erection drawings as furnished by manufacturer.
4. All exposed fasteners shall be either pre-painted to match wall color or shall be covered with plastic color caps to match wall color.

D. Thermal Insulation: Provide glass fiber blanket insulation, of not less than 0.5 lb. per cu. ft. density, 4" nominal thickness at wall panels, with UL flame spread classification of 25 or less, and 2" wide continuous vapor tight edge tabs. Insulation shall be faced with manufacturer's standard vinyl film vapor barrier.
1. Retainer Strips: Provide 26 gage formed galvanized steel retainer clips to hold insulation in place at roof panels.

2.4 MATERIALS - ROOF PANELS

A. Refer to SECTION 07 41 20 - PREFINISHED METAL ROOF PANELS.

B. Roof Panels: Provide drawing quality aluminum coated steel sheets complying with requirements of ASTM A 463; coated both sides with a layer of aluminum-zinc alloy (approximately 55% aluminum, 45% zinc) applied by the continuous hot-dip method. Metal thickness not less than 24 gage (0.0239").
   1. Color: Painted with exterior colors a full strength, 70% Kynar® 500/Hylar 5000™ fluoropolymer coating. Manufacturer warrants that coating shall not blister, peel, crack, chip, or experience material rust-through for 20 years. For a period of 20 years chalking shall not exceed #8 - ASTM and fading shall be 5ΔE Color Difference Units or less.
   2. Provision for a full 2½" thermal movement of the roof panel shall be accomplished by the use of clips with self-centering movable tabs and shall be non-friction creating during thermal expansion cycles. The movable tab shall be made of high strength 304 stainless steel. The clip base shall be a minimum of 16 ga. galvanized steel. The clip system shall provide a self-centering mechanism to center the clip during erection. The force required to move the movable tab shall not exceed 8 lbs.
   3. The roof shall provide for thermal expansion/contraction without detrimental effect to the roof panel when there is a 100°F. temperature difference between the inside structural framework of the building and the temperature of the roof panels.
   4. Roofing assemblies shall be installed on a minimum ¼" in 12" downslope to drain, except at endwalls which may be warped to a lesser elevation when "flat roofed" appearance is desired. All gable end panels installed below ¼" to 12" shall have sufficient elevation to provide positive drainage.
   5. Panels of maximum possible lengths shall be used to minimize end laps. Panel end splices shall allow the roof panels to expand and contract with roof panel temperature changes, with a floating splice connection. Endlaps shall be staggered 5'-0" at alternating panels. Continuous in line splices will not be permitted. Panel end laps shall be not less than 6", sealed with sealants and fastened together by aluminum clamping plates, forming a free floating splice. Sealant at end laps shall contain PVC beads to prevent expulsion of the sealant during fastening process.
   6. Ridge assembly shall be designed to allow roof panels to move lengthwise with expansion/contraction as the roof panel temperature changes, and the ridge assembly itself shall be designed to accommodate expansion/contraction in its own length caused by thermal movement.
   7. All endwall trim and roof transition flashing shall allow the roof panel to move relative to the wall panels as the roof expands and contracts with temperature changes.
   8. All sidelap sealant shall be factory applied.
   9. Material used in flashing and transition parts shall match the roof panel materials, be compatible, and shall not cause a corrosive condition. Copper and lead materials shall not be used with zinc or aluminum coated panels.

C. Thermal Insulation: Provide glass fiber blanket insulation, of not less than 0.5 lb. per cu. ft. density, 6" nominal thickness at roof panels, with UL flame spread classification of 25 or less, and 2" wide continuous vapor tight edge tabs. Insulation shall be faced with manufacturer's standard vinyl film vapor barrier.
   1. Provide thermal spacers.
   2. Retainer Strips: Provide 26 gage formed galvanized steel retainer clips to hold insulation in place at roof panels.
   3. Provide insulation Liner System with minimum R-25.

D. Fasteners:
   1. All connections to roof panels shall be made with clips with movable tabs that are seamed into the standing seam sidelaps. Panel-to-panel connections shall be made with positive field formed double lock standing seam.
   2. Exposed fasteners are permitted at the eave and splice only.
   3. Exposed eave fasteners shall be aluminum-zinc coated or stainless steel.
   4. Splice fasteners shall be stainless steel.

E. Metal Accessories: Provide miscellaneous items as required for installation of work; all trim and metal flashing associated with the preformed metal panels shall receive the same finish as panels.
   1. Pipe flashing units shall be constructed of E.P.D.M. (ethylene Propylene Diene Monomer) rubber as manufactured by DuPont (Nordel 1440 Hydrocarbon). Unit shall be black in color with a ductile aluminum (Alloy A1100-0) reinforcing ring bonded to a rubber flange on the base of the flashing unit.

F. Sealant: Provide one-part elastomeric polyurethane, polysulfide or silicone rubber sealant as recommended by roofing panel manufacturer.

2.5 TRANSLUCENT PANELS

A. Insulated Translucent Panels: Refer to SECTION 08 45 23 - INSULATED TRANSLUCENT SANDWICH PANEL WALL.

PART 3 - EXECUTION

3.1 INSTALLATION AND ERECTION

A. General: Install preformed metal roofing and wall panels and related items in accordance with roofing panel manufacturer's instructions.

B. Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than 7 days after placement.

C. Purlins and Girts: Provide rake purlins with tight fitting closure channels. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.

D. Bracing: Provide diagonal rod or angle bracing in both roof and sidewalls as indicated.

E. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

F. Roof Panels:
   1. Position and align panel with the eave structural member and align the panel with the panel clip.
   2. All side laps shall be field sealed by a lock-seaming device. Side lap sealant shall be factory applied.
   3. Panel end laps shall be not less than 6", sealed with sealants and fastened together by clamping plates, forming a free floating splice.
   4. Panel clips shall be attached to the secondary structural members.

G. Translucent Panels: Attach translucent panels to structural framing with fasteners according to manufacturer's written instructions. Install panels perpendicular to supports. Anchor translucent panels securely in place, with provisions for thermal and structural movement.
   1. Provide end laps of not less than 6 inches and side laps of not less than 1 1/2 inch corrugations for metal roof panels.
   2. Seal intermediate end laps and side laps of translucent panels with translucent mastic.

H. All connections of roof panels to structural members shall be made with clips with movable tabs that are seamed into the double lock standing seam side lap. Panel clips shall be attached to the secondary structural members.

I. Panel-to-panel connections shall be made with positive field formed Pittsburgh double lock standing seam.

J. Standing seams shall be formed by an electrically powered mechanical lock seaming device. Hand seaming devices may be required in some areas.

K. Anchor components parts of the preformed metal roofing securely in place, providing for necessary thermal and structural movement.

L. Thermal Insulation: Install insulation concurrently with installation of roof and wall panels in accordance with manufacturer's published directions. Install blankets straight and true in one-piece lengths with both sets of tabs sealed to provide a complete vapor barrier. Locate insulation on the underside of roof sheets, extending across the top flange of purlin members and held in place by retainer strips at each longitudinal joint of insulation, installed straight and taut. Provide thermal spacer blocks in accordance with manufacturer's recommendation.

M. Install and securely anchor metal flashing, trim, gutters and related items to provide a weatherproof enclosure, no fasteners shall be exposed on the exterior face of the work.

N. Upon completion of installation of gutters, test gutters for leaks. Block off downspouts and fill gutters with water. Inspect gutters for leaks, repair leaks and re-test sections of gutters until all sections are leak-proof.

O. Upon completion and during all roofing operations roof panels, gutters and other system components shall be thoroughly cleaned of filings, tailings, spatters and excess materials.

P. During all mechanical and painting operations, provide temporary protective coverings to prevent damage by overspray, solders or other contaminants.

Q. Structural system shall be plumb before wall panels are attached.

R. Panels shall be aligned and attached in accordance with erection drawings furnished by Butler Manufacturing Company.

S. All sidelaps shall be at least one full corrugation.

T. Panels shall be sealed at the base with metal closures.

END OF SECTION

ROOFING WARRANTY

WHEREAS _____

of (Address) _____

herein called the "Roofing Contractor", has performed roofing and associated work ("work") on following project:

Owner: _____

Address: _____

Name and Type of Building: _____

Address: _____

Area of Work: _____ Date of Acceptance: _____

Warranty Period: _____ Date of Expiration: _____

AND WHEREAS Roofing Contractor has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

NOW THEREFORE Roofing Contractor hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in watertight condition.

This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
   a. lightning;
   b. Peak gust wind speed exceeding building design per hour;
   c. fire;
   d. failure of roofing system substrate including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. faulty construction of chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. vapor condensation on bottom of roofing; and
   g. activity on roofing by others including construction contractors, maintenance personnel, other persons, and animals whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Contractor, and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
3. The Roofing Contractor is responsible for damage to work covered by this Warranty, but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Contractor, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void upon date of said alterations, but only to extent said alterations affect work covered by this Warranty. If Owner engages Roofing Contractor to perform said alterations, Warranty shall not become null and void, unless Roofing Contractor, prior to proceeding with said work, shall have notified Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this warranty.
5. The Owner shall promptly notify Roofing Contractor of observed, known or suspected leaks, defect, or deterioration, and shall afford reasonable opportunity for Roofing Contractor to inspect work, and to examine evidence of such leaks, defects, or deterioration.
6. This Warranty is recognized to be the only warranty of Roofing Contractor on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to him in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Contractor of responsibility for performance of original work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

_____
Installation Company

_____
By

_____
Title

_____
Business Address

_____
Telephone Number FAX Number

ATTEST:

_____
Secretary

IN WITNESS THEREOF, this instrument has been duly executed this

_____day of _____, 20_____.

(INSERT APPROPRIATE EXECUTION FORM)

* * * * *

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 13 42 75

INTEGRATED INTERIOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Delegated design of integrated interior assemblies for seismic locations.
2. Assembly framing.
3. Finish panels.
4. Doors and frames.
5. Door hardware.
6. Electrical.
7. Communications.
8. Mechanical/Plumbing Accommodation.
9. Factory integrated components.
10. Site integrated components.

B. Related Requirements:
1. 01 31 19 - Project Meetings: for additional requirements of preinstallation meeting.
2. 01 45 00 - Quality Control: for additional requirements related to Quality Requirements and testing.
3. 08 11 00 - Doors and Frames for site integrated components.
4. 08 71 00 - Door Hardware for site integrated components.
5. Division 26 - Electrical for site integrated components and commissioning.
6. Division 27 - Communications for site integrated horizontal cabling.
7. Division 28 - Electronic Safety and Security for site integrated components.

1.2 DEFINITIONS

A. Finish Panel: Site installed panels with factory applied final finish and cutouts for accommodation of mechanical, electrical and plumbing components.

B. Conventional back box: Standard NEC device metallic back box.

C. Specialty back box: Proprietary back box required for devices other than those specified in this section.

D. Factory Integrated Components: Materials or components specified in other sections for factory assembly within integrated interior assemblies.

E. Site Integrated Components: Materials or components specified in other sections for site assembly within integrated interior assemblies.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene before starting installation work of this section in accordance with SECTION 01 31 19 - PROJECT MEETINGS.
1. Attendees: Owner’s representative, Architect, Contractor, and all Subcontractors interfacing with integrated interior assemblies.
2. Review preparation, sequencing and installation procedures of the integrated interior assemblies to coordinate the work of this section with other impacted sections.

1.4 SUBMITTALS

A. Submit the following in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

B. Submittals must be reviewed and approved by the Contractor before sending to the Architect for review.

C. Sample: Submit two samples for verification of selected finish as scheduled upon request unless noted otherwise. All wood veneer and non-standard custom finishes must be reviewed and approved by the Architect.
   1. Chroma coat:
   2. Standard Color: 2 x 2 inch (51mm x 51mm) paint chip.
   3. Custom Color: 4 x 6 (102mm x 153mm) inch on MDF.
   4. Powder Coat: 2 x 4 inch (51mm x 102mm) on metal.
   5. Fabric: As provided by textile manufacturer.
   6. Glass: 4 x 4 inch (102mm x 102mm).
   7. Thermofoil: As provided by thermofoil manufacturer.
   8. WriteAway Laminate: 4 x 8 inch (102mm x 203mm).
   9. Custom Graphics: As provided by manufacturer based on finish type.

D. Product Data: Provide manufacturers standard tech sheets as applicable to the project for the following: Assembly framing, Finish Panels, Doors and Frames, Door Hardware, Electrical, Communications, Mechanical/Plumbing Accommodation and Accessories.

E. Pre-Manufacture Submittals: Provide the following information to the manufacturer prior to development of shop drawings.
   1. Field measurements of existing construction, future construction, finished width and height of walls and associated components, as well as design team provided plans and elevations.
      a. Where field measurements are not possible, hold-to and control dimensions must be coordinated and agreed upon by all parties who interface with the integrated interior assemblies through the Shop Drawing process before manufacturing begins.
   2. Wall hung items: Include make, model, size, configuration and any additional pertinent product data for wall hung items such as furniture, fixtures, equipment and casework.
   3. Assembly framing: Include selected wall types.
   4. Finish Panels: Include finishes and configurations.
   5. Doors and Frames: Include cores, finishes, frames, and operations.
   6. Door Hardware: Include manufacturers standard hardware and site integrated component hardware.
      a. One sample of each type of Site Integrated Door Hardware that is to be installed in doors included in this section shall be sent to manufacturer for review and approval.
   7. Electrical: Include device type and location, schedules indicating electrical device specifications, amperage, ground pin orientation, type of solution, wiring configuration, receptacle, faceplate and trim ring colors and styles, and any Factory or Site Integrated Components.
   8. Communications: Include device type and location, schedules indicating communications device specifications, type of solution, cabling configuration, faceplate and data jack colors and styles and any Factory or Site Integrated components.
   9. Mechanical/Plumbing Accommodation: Include product data, fabrication drawings and schematics for any Factory or Site Integrated Components.
   10. Factory Integrated Components: Provide make, model, size, configuration, materials and any additional pertinent product data for factory assembly.
   11. Site Integrated Components: Provide make, model, size, configuration and any additional pertinent product data for site installation.

F. Shop Drawings: Submit shop drawings for review prior to commencing any fabrication of the integrated interior assemblies. Coordinate as required until scope is confirmed by all affected stakeholders. Include manufacturer provided plans, elevations, sections, schedules and applicable notes per the following:
   1. Prior to shop drawing submittal review the drawings for obvious drafting and detailing errors.
   2. Indicate material descriptions, dimensions and profiles of adjacent components and assemblies interfacing with the integrated interior assemblies.
   3. Indicate field measurements of existing construction, future construction, finished width and height of assemblies and associated components.
   4. Assembly framing: Indicate reveal type, profile type, finishes and attachment to base building.
   5. Finish Panels: Indicate finishes, cores, glazing, accessories and configurations.
   6. Doors, Frames and Hardware: Include elevations indicating glazing and finishes, schedules indicating door tags, styles, dimensions, handing, hardware and finishes.
   7. Electrical:
      a. Coordinate electrical components specified herein with the documents provided by the electrical engineer of record.
      b. Indicate types and locations of wiring devices, outlet, junction and pull boxes, copper conductors and cables, conduit, electrical branch circuiting, amperage, ground pin orientation, wiring diagrams, and faceplate, receptacle and trim ring colors and styles.

8. Mechanical/Plumbing Accommodation: Indicate location of chase, mounting brackets and blocking, and provisions for fixture carriers.
9. Communications: Indicate device type and location of components within the integrated interior assembly. See division 27 for additional submittal requirements.
10. Factory and Site Integrated Components: Indicate device type and location.

G. Manufacturer's Installation Instructions: Indicate any special preparation of base building conditions, installation and attachment methods.

H. Operation and Maintenance Data: Provide maintenance data for incorporation into operation and maintenance manuals.

I. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

J. Installer Performed Testing: Submit documentation of installer performed tests and certification for submission to the Authority Having Jurisdiction.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section, of the quality and complexity required for this project for a minimum 10 years. Show production facilities capable of meeting contract requirements for single-source responsibilities and warranty.
2. Wall Installer Qualifications: Company trained and certified by manufacturer and specializing in performing the work of this section.
3. Integrated Electrical Components Installer Qualifications: Connections to the base building electrical system and all field installed electrical components, devices, and accessories require installation by an electrical contractor licensed in the jurisdiction of the project in accordance with applicable building and electrical codes and standards. Such work shall be performed under permit, tested, and inspected to confirm adequacy of final installations to the satisfaction of the Authority Having Jurisdiction.

B. Source Limitations: Obtain integrated interior assemblies from a single source.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver or install integrated interior assemblies until spaces are enclosed and weather-tight, wet work is complete and dry, work above ceilings is substantially complete, and HVAC system is operational and able to maintain ambient temperature and humidity conditions between 60 and 90 degrees Fahrenheit (15.5 and 32.2 Celsius) with Relative Humidity maintained between 25 and 60 percent.

B. Do not allow packaging to get wet or develop condensation.

C. Comply with the manufacturer’s requirements for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.7 WARRANTY

A. Manufacturer Warranty: Provide 10 year warranty on walls, doors, door frames, electrical, communications and Mechanical/plumbing accommodations for failures in materials or workmanship as indicated by the manufacturer standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Specification is based on products listed below by DIRTT Environmental Solutions.
1. Substitutions for products by manufacturers other than those listed above shall be submitted for review in accordance with SECTION 01 62 00 - PRODUCT OPTIONS.

2.2 DESCRIPTION

A. Factory assembled, site installed, integrated interior assemblies, including Assembly framing, Finish Panels, Doors and Frames, Door Hardware, Electrical, Communications, Mechanical/Plumbing Accommodation, and Factory and Site Integrated components.

2.3 PERFORMANCE AND DESIGN CRITERIA

A. Provide integrated interior assemblies that are factory sub-assembled, and site installed to integrate with the base building structure, shell, mechanical, electrical and plumbing systems.

B. Integrated Interior Assembies shall be non-progressive in method of installation so that frame modules within an elevation can be removed, added or changed without affecting adjacent frame modules.

C. Walls shall utilize factory finish site installed panels that mechanically fasten to a factory finished and assembled aluminum structural frame module. Finish panels may be monolithic or segmented with the ability to span off-module, or across multiple frames in segments or monoliths, vertically and horizontally.

D. Assembly shall allow for independent configuration of assembly framing, finishes and functions relative to each side of the wall.

E. Assembly shall be comprised of components which can be disassembled, relocated and field cut and substantially reused for future reconfigurations allowing for adaptability and retrofitting of the Assembly framing, Finish panels, Doors and Frames, Door Hardware, Electrical, Communications, Mechanical/Plumbing Accommodation, and Factory and Site Integrated components.

F. Assembly framing shall be capable of supporting wall hung accessories including but not limited to: casework, furniture, systems furniture, shelves, countertops and equipment in channels or reveals that are integrated within the structural frame and enable universal horizontal alignment without damaging finishes.

G. Integrated interior assembly shall provide accommodation or provision for the embedding (fully encased behind glass) of electronics in the wall cavity. Structural framing shall allow for universal non-standard AV display, sound, and various support equipment to be mounted in the cavity of the wall with all required structural brackets, wire management, access and ventilation equipment to prevent overheating.

H. Integrated interior assembly shall enable access of the internal cavity from either side without the addition of an access panel or need for repairing of finishes.

I. Provide integrated interior assembly with a continuous open cavity vertically and horizontally free of structural impediments for the routing of mechanical, electrical and plumbing components.

J. Provide integrated interior assemblies capable of accommodating up to a 1-inch (25 mm) gap between the top, bottom and side edges of the prefabricated assembly and base building elements.

K. Provide an integrated interior assembly system capable of accepting pressure fit extrusions and co-extrusions to fill voids between finish panels, at ceiling connections, and other base building connections.

L. The manufacturer of finish panels specified herein shall be capable of incorporating owner provided factory finished custom graphics on finish panels.

M. Structural Performance:
   1. Capable of withstanding the effects of loads and stresses within limits allowable by the local authority having jurisdiction and under conditions indicated:
      a. Transverse Load: Lateral deflection of the overall span when tested under a uniformly distributed load of 5 psf (0.24 kN/m2) in accordance with ASTM E72 where (L) equals wall height:
         1) Solid Walls: not more than L/120
         2) Glass Walls: not more than L/175 or 3/4 inch (19 mm) whichever is more stringent.
      b. Where glass panels are installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges of glass shall not be greater than the thickness of glass when a force of 50 pounds per linear foot (plf) (730 N/m) is applied horizontally to one panel at any point up to 42 inches (1067 mm) above the walking surface.

N. Acoustic Attenuation:
   1. Sound Transmission Class (STC) rating of integrated interior assemblies shall be calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
   2. Interior Walls Indicated as Acoustic: Provide completed assemblies with the following characteristics:
      a. Four inch (102mm) solid wall: [33]-50 STC.
      b. Back to back four inch (102mm) solid walls: 54-63 STC.
      c. Four inch (102mm) single glazed wall: [30]-35 STC.

O. Fire Resistance:
   1. Surface-Burning Characteristics:
      a. Finish materials shall be tested in accordance with ASTM E84 or NFPA 286.
   2. Integrated Interior Assembly shall be approved for use by a qualified independent testing agency in Type I and Type II Construction.

P. Assembly UL Ratings:
   1. UL QQXX ; Sections and Units per 2017 NFPA 70 National Electrical code.
   2. UL QQYZ; Wiring Assemblies.
   3. UL 183; Standard for Safety for Manufactured Wiring Systems.
   4. UL 498; Standard for Safety for Attachment Plugs and Receptacles.
   5. UL 507; Component Fans, Electric.
   6. UL 514A; Standard for Safety for Metallic Outlet Boxes.
   7. UL 514 B; Standard for Conduit Cable and Fittings.
   8. UL 514C; Standard for Safety for Non; Metallic Outlet Boxes, Flush; Device Boxes, and Covers.
   9. UL 514D; Standard for Safety for Cover Plates for Flush; Mounted Wiring Devices.
   10. UL 723; Standard for Test for Surface Burning Characteristics of Building Materials
   11. UL 1784; Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives.

2.4 ASSEMBLY FRAMING

A. One sided wall framing: Fully assembled non-bearing structural frame module with site installed finish panels on one side.
   1. Wall Thickness: Actual 2.125 inch (54mm) or 3.8 inch (96mm) or 5.8 inch (147mm) in locations indicated by drawings.
   2. Reveal Type and Size: Classic 0.354 inches (9 mm)
   3. Material: Aluminum extrusions, 6063-T6 aluminum alloy classified as noncombustible in accordance with ASTM E136 per 2018 IBC 703.5.1.
      a. Thickness: As required to meet performance requirements.
   4. Top Track: Continuous, with intermittent breaks for pass through of building services or structural components.
   5. Bracing: as required to meet structural performance requirements.
   6. Bottom Track: Integral with modular frames.
      a. Provide frame bases with continuous adjustment mechanism for 1-1/2 inch (38mm) height adjustment to accommodate floor slab variances.
      b. Accessories: on-seismic carpet grippers or non-seismic smooth floor tape.
   7. Vertical Element Spacing: As required to meet performance requirements within a minimum of 6 inches (152mm) and a maximum of 48 inches (1219mm).
   8. Blocking Bracket: Adjustable factory mounted 4 inch (102mm) concealed structural blocking fabricated of 12 gauge or 16 gauge galvanized steel in a horizontal or vertical orientation between aluminum extrusions for wall mounted components.
   9. Provide cutouts and support brackets as required for plumbing, electrical and communication pass through from frame to frame.
   10. Insulation: manufacturers standard non-woven, unfaced recycled denim batt insulation containing cotton fibers and proprietary materials with a flame spread index of 25 or less and smoke developed index of 450 or less when tested in accordance with ASTM E84 and has been evaluated for corrosiveness, fungi-resistance, and moisture absorption by testing in accordance with ASTM C739.

B. Two sided wall framing: Fully assembled non-bearing structural frame module with site installed finish panels on both sides.
   1. Wall Thickness: Actual 4 inch (102mm), 6 inch 152mm) or 6 to 12 inch (152mm to 305mm) parametric expandable wall in locations indicated by drawings.
   2. Reveal Type and Size: Classic 0.354 inches (9 mm)
   3. Material: Aluminum extrusions, 6063-T6 aluminum alloy classified as noncombustible in accordance with ASTM E136 per 2018 IBC 703.5.1.
      a. Thickness: As required to meet performance requirements.

4. Top Track: Continuous, with intermittent breaks for pass through of building services or structural components.
5. Bracing: as required to meet structural performance requirements
6. Bottom Track: Integral with modular frames.
   a. Provide frame bases with continuous adjustment mechanism for 1-1/2 inch (38mm) height adjustment to accommodate floor slab variances.
7. Accessories: non-seismic carpet grippers or non-seismic smooth floor tape.
8. Vertical Element Spacing: As required to meet performance requirements within a minimum of 6 inches (152mm) and a maximum of 48 inches (1219mm).
9. Blocking Bracket: Adjustable factory mounted 4 inch (102mm) concealed structural blocking fabricated of 12 gauge or 16 gauge galvanized steel in a horizontal or vertical orientation between aluminum extrusions for wall mounted components.
10. Provide cutouts and support brackets as required for plumbing, electrical and communication pass through from frame to frame.
11. Insulation: manufacturers standard non-woven, unfaced recycled denim batt insulation containing cotton fibers and proprietary materials with a flame spread index of 25 or less and smoke developed index of 450 or less when tested in accordance with ASTM E84 and has been evaluated for corrosiveness, fungi-resistance, and moisture absorption by testing in accordance with ASTM C739.

C. Glazed wall framing: Site assembled non-bearing structural frame module with glass infill.
   1. Wall Thickness: Actual 4 inch (102mm).
   2. Extrusion Profile: Rectilinear
   3. Reveal Type and Size: Classic 0.354 inches (9 mm)
   4. Material: Aluminum extrusions, 6063-T6 aluminum alloy classified as noncombustible in accordance with ASTM E136 per 2018 IBC 703.5.1.
      a. Thickness: As required to meet performance requirements.
   5. Top Track: Continuous, with intermittent breaks for structural components.
   6. Bracing: as required to meet structural performance requirements
   7. Bottom Track: Integral with modular frames.
      a. Provide frame bases with continuous adjustment mechanism for 1-1/2 inch (38mm) height adjustment to accommodate floor slab variances.
      b. Accessories: non-seismic carpet grippers or non-seismic smooth floor tape.
   8. Vertical Element Spacing: As required to mee t performance requirements within a minimum of 6 inches (152mm) and a maximum of 60 inches (1524mm).
      a. Vertical Element spacing may exceed 60 inches (1524mm) with manufacturer review and approval.
   9. Glazing Finish Panel: Per Schedule Below.
   10. Glazing Gasket Color: black.

D. Assembly framing Exposed Finishes:
   1. Powder coat:
      a. Finish: Per Finish Schedule below.

2.5 FINISH PANELS

A. Factory Finished Panel: Finish panels shall meet the finish classification requirement per International Building code for the proposed location in the building.
   1. Core Material: Medium Density Fiberboard Core (MDF).
      a. Features:
         1) No Added Formaldehyde (NAF MDF) and TSCA Title VI compliant.
   2. Finish Material: Manufacturer standard options shall be classified in accordance with ASTM E84. See Finish Schedule below for additional information.
      a. ChromacoatPlus: Manufacturers standard no Volatile Organic Compounds (VOC) water-based paint sprayed onto substrate with cleanable clear topcoat.
         1) Maximum Size: 60 x 120 inches (1524mm x 3048mm).
         2) Finish Classification: Class C with NAF MDF core.
      b. Thermofoil: 3D laminate film vacuum formed to substrate.
         1) Maximum Size: 48 x 120 inches (1219mm x 3048mm).
         2) Finish Classification: Class B with NAF MDF core.
      c. WriteAway: Dry Erase 3D laminate film vacuum formed to substrate.
         1) Maximum Size: 46 x 120 inches (1168mm x 3048mm).
         2) Features: Magnetic with Matte Finish, High Gloss Finish or Graphics
         3) Finish Classification: Class C with NAF MDF core.
   3. Mounting: Face Mounted.
   4. Thickness:
      a. Typical: 1/2 inch (13mm).

B. Glass Finish Panel:
   1. Glazing Material:
      a. Tempered glass: Architectural flat glass per ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type 1, Class 1 (transparent), Quality q3. Complies with CPSC-16 CFR Part 1201 Category II per IBC 2018.2406.2.
         1) Features: Meets ANSI Z97.1 Safety Glazing Material standards.
         2) Thickness: 1/4 inch (6mm).
         3) Finish: Per Finish Schedule below.
   2. Mounting: Center Mounted for glazed walls and doors and Face Mounted for integrated component protection or writable surface
      a. Face Mounted Features:
         1) Aluminum mounting rails to maintain alignment with adjacent finishes.
         2) Where specified 1/4 inch (6mm) tempered glass has a maximum size of: 60 x 120 inches (1524mm x 3048mm).
         3) Magnetic back painted glass where indicated by plans and/or elevations.

2.6 DOORS AND FRAMES

A. Coordinate ADA, ANSI, Access Control and Fire Life Safety requirements with drawings and schedules prior to the development of shop drawings per Pre-Manufacture Submittal requirements.

B. Hardware Preparation and Reinforcement: Factory milled, reinforced, drilled and taped doors and frames by manufacturer to receive Integrated Hardware Components as scheduled.
   1. Factory milled doors and frames with hinge locations and sizes as determined by integrated interior assembly manufacturer; including factory installed steel backer plates.
   2. Access Control Components: Factory provided rough in for Site Integrated Components and integrated interior assembly manufacturer provided hardware.

C. Provide manufacturers standard UL 1784 “S” labeling on doors within smoke partitions as indicated by door schedules.

D. Coordinate door types, sizes, operations and hardware requirements specified within this section with drawings and door schedules.

E. Door Thickness is 1-11/16 inch (43mm) unless noted otherwise.

F. Aluminum Framed Glass Doors:
   1. Type: “Phat”
      a. Operation: side hung swing
      b. Stile and Rail Dimensions: 4 inch (102mm) side stiles, 6 inch (102mm) top rail, 6 inch (152mm) bottom rail or 10 inch (254mm) ADA bottom rail.
      c. Glazing: Tempered 1/4 inch (6mm).
   2. Finish:
      a. Powder coat.
         1) Color: Per schedule below.
   3. Adjustability: Provide door skirt to accommodate varying floor levels.
   4. Features: UL 1784 Smoke and draft control door assemblies with 4 inch (102mm) or 6 inch (152mm) stiles for side hung swing doors only as scheduled.

G. Door Frames:
   1. Architectural grade structural aluminum factory finished and integrated with wall framing.
   2. Door frames capable of reconfiguration without part replacement or damage to wall components.
   3. Frames are shipped knocked down and assembled on site.
   4. Jambs shipped over length by 2 inches (50 mm) in height, for field cutting to suit opening height for proper alignment with adjacent frames.
   5. Extrusion Profile: Rectilinear.
   6. Configuration: As required by door operation or function.
   7. Size: As required for doors sizes indicated on Door Schedule.
   8. Standard Frame Depth: 4 inches (102mm)
   9. Finish:
      a. Clear Anodized Aluminum: AAMA 611, AAM12C22A31, Class I
      b. Powder coat.
         1) Color: Per Finish Schedule below.

2.7 DOOR HARDWARE

A. Site Integrated Components: Provide in accordance with Division 08 Openings and Division 28 Electronic Safety and Security.

B. All Hardware indicated in this section to be provided by the manufacturer or the manufacturers distribution partner and installed on site unless indicated otherwise.

C. General Door Hardware:
   1. Hinges: Stanley 4-1/2 x 4 inch (114mm x 102mm) Butt Hinge F179. Four hinges per door; no exceptions.

2.8 ELECTRICAL

A. Copper Conductors and Cables:
   1. Armored Cable (Type AC): Multi conductor Type AC with 3, 5 or 8 insulated copper conductors in size #12 AWG factory assembled from the pre-terminated device with an additional 10 feet (3.05 m) extending from the top or bottom edge of the frame.
      a. Features:
         1) Conventional Wiring: Pig Tail conventional hard wire connection to base building branch circuit conductor per Division 26 requirements.
         2) Modular Wiring: Quick connect pre-terminated modular system for wiring modular devices per shop drawings.
         3) Extender Cable: Quick connect pre-terminated at both ends modular system for wiring modular devices per shop drawings.
         4) Power Whip: Manufacturer standard modular connector at one end and Pig Tail conventional hard wire connection at opposite end for connection to base building branch circuit conductor per drawings and Division 26 requirements.
   2. Flexible Conduit Cable: Manufacturers standard UL listed multi conductor fabricated of lightweight NEC Type FMC, high-strength aluminum alloy with 3, 5, or 8 insulated copper conductors in size #12 AWG factory assembled from the pre-terminated device.
      a. Features:
         1) Modular Wiring: Quick connect pre-terminated modular system for wiring modular devices per shop drawings.
         2) Extender Cable: Quick connect pre-terminated at both ends modular system for wiring modular devices per shop drawings.
         3) Power Whip: Manufacturer standard modular connector at one end and Pig Tail conventional hard wire connection at opposite end for connection to base building branch circuit conductor per drawings and Division 26 requirements.
   3. Express Line Modular Cable: UL listed cable assembly for connecting Modular Panel Manager to pre-terminated modular assemblies. Composed of manufacturers standard lightweight NEC Type FMC, high-strength aluminum alloy with 3, 5 or 8 insulated copper conductors in size #10 AWG.
      a. Features:
         1) Length: Up to 150 feet (45.72 m).
   4. Modular Splitter: Modular cable quick connect device for power distribution to be secured to wall, floor or above ceiling per shop drawings.
   5. Conventional Cable: Power conductors and cables not provided by manufacturer are provided in accordance with division 26.

B. Conduit:
   1. Electric Metal Tubing (EMT): Conduit pathways [1/2 inch (13 mm)] [3/4 inch (19 mm)] factory mounted within the integrated interior assembly framing, from outlet junction box to top or bottom of assembly to permit wiring installation and connections as specified in Divisions 26, 27, and 28.
      a. Material: Coated steel.
      b. Feature: Provide with manufacturers standard plastic grommet at one end.
   2. Flexible Metal Conduit: Provide UL listed flex conduit per ANSI/UL-1, NEC Type FMC fabricated of lightweight, high-strength aluminum alloy.
   3. Refer to Division 26, 27, and 28 for additional conduit raceway and pull-string requirements.

C. Outlet Junction and Pull Boxes
   1. Conventional back box and mounting bracket: Factory mounted.
   2. Manufacturers standard back box and mounting bracket: Factory mounted.
   3. Specialty Back Box: Provide to manufacturer for factory mount.

D. Face Plates and Trim Rings:
   1. Manufacturer standard faceplates: Factory provided, Factory installed
      a. Color: [White] [Ivory] [Grey] [Black] [Stainless Steel]
      b. Construction: 2 adjustment screws at top and bottom for flush installation.
   2. Manufacturer standard trim rings: Factory provided, site installed.
      a. Color: [White] [Ivory] [Grey] [Black]
   3. Conventional face plates: Provide in accordance with division 26 requirements.
   4. Engraving/Identification: Provide in accordance with division 26 requirements.

E. Wiring Devices
   1. Pre-terminated 15 or 20 amp receptacle factory assembled in outlet junction box.
      a. Color: White except as follows: [Red for emergency circuits] [Ivory] [Orange] [Grey] [Blue] [Black]
      b. Ground Pin Orientation: [Down] [Up] [Left] [Right]
      c. USB charging port as located per drawings: Type A, 5 amp, 5 volt

2.9 COMMUNICATIONS

A. Conduit:
   1. Provide in accordance with section 13 42 75 Integrated Interior Assemblies electrical article above.
   2. Manufacturers proprietary aluminum 1 x 2 inch (25mm x 50mm) rectangular aluminum conduit factory mounted to integrated interior assembly framing from device box to top or bottom of assembly to permit wiring installation and connections as specified in Division 27.

B. Outlet Junction and Pull Boxes:
   1. Conventional back box and mounting bracket: Factory mounted.
   2. Modular back box and mounting bracket: Factory mounted.
   3. Specialty Back Box: Provide to manufacturer for Factory mounting.

C. Horizontal Cabling:
   1. Provide in accordance with Division 27 requirements.

D. Face Plates and Trim Rings:
   1. Modular faceplates: Factory provided, Factory installed
      a. Color: [White] [Ivory] [Grey] [Black] [Stainless Steel]
      b. Construction: 2 adjustment screws at top and bottom for flush installation.
   2. Modular trim rings: Factory provided, site installed.
      a. Color: [White] [Ivory] [Grey] [Black]
   3. Conventional face plates: Provide in accordance with Division 27 requirements.
   4. Engraving/Identification: Provide in accordance with Division 27 requirements.

E. Data Jack:
   1. Provide in accordance with Division 27 requirements.

2.10 MECHANICAL/PLUMBING ACCOMMODATION

A. Mechanical Chase: Manufacturers standard weldments and sheet metal spanning plates for accommodating in wall mechanical systems and/or plumbing.
   1. Dimensions at 4 inch (102mm) thick wall: 6 inch (152mm) width minimum x 16 inch (406mm) width maximum with an interior depth of 2.5 inch (64mm) of clear space for accommodating assemblies.
      a. Maximum width dimension may exceed 16 inches (305mm) with manufacturer review and approval.
   2. Dimensions at 6 inch (152mm) thick wall: 6 inch (152mm) width minimum x 16 inch (305mm) width maximum with 4.5 inches (114mm) of clear space for accommodating assemblies.
      a. Maximum width dimension may exceed 16 inches (305mm) with manufacturer review and approval.
   3. Mechanical/Plumbing system assemblies: Provide as specified by appropriate section.

2.11 SITE INTEGRATED COMPONENTS

A. Door Hardware – per division 08 and 28

B. Integrated Technology.
   1. Interactive Display Markerboard (4) – Contractor Furnished
   2. Entrance Lobby TVs (2) – Owner Furnished
   3. Head Coaches Conference Room TV (1) – Owner Furnished

2.12 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

B. Manufacturer's accessories required by the project:
   1. Manufacturer Standard Base Trim: Mechanically fastened recessed and adjustable to accommodate gaps between assembly and base building elements.
      a. Color: Black
   2. Manufacturer Standard Ceiling Trim: Mechanically fastened recessed and adjustable to accommodate up to a 1/2 inch (13 mm) gap between assembly and base building elements.
      a. Color: Black
   3. Ceiling Perimeter Hanger: Manufacturer provided 1-1/8 inch (29mm) exposed perimeter edge angle extrusion for supporting lay-in panel ceiling systems. Seismic Suspension Edge Clips to meet code required movement without 2 inch (51mm) wall angles and all other acoustical ceiling components per section 09 51 00 Acoustical Ceilings.
   4. Opti-filler Pressure Fit Gaskets:
      a. Wall Panel Seal at Reveal: Provide extrusions and co-extrusions to fill voids between finish panels, at ceiling connections, and at base building connections as required. (both horizontal and vertical gaskets). Coordinate final locations of gaskets with manufacturer through the shop drawing process prior to procurement of fabrication.
   5. Integrated Display Panel Edge Profile: Manufacturers standard trim for finishing edge of cutouts at finish panels with integrated display not behind glass.
      a. Color: Powder Coat: PWD-[#]

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.
   1. Floor Levelness:
      a. Contiguous wall lengths less than 40 feet: Base building sub-floor shall be level within 3/8 inch over 10 feet.
      b. Contiguous wall lengths greater Than 40 feet: Base building sub-floor shall not exceed a maximum total floor flatness deviation greater than 1-1/8 inches.
   2. Vertical leading edge of assembly framing to base building: Where partitions attach to adjacent walls, the finish face shall be plum within 1/2 inch over 10 feet.
   3. Top of assembly framing to base building: Where partitions attach to bulkhead or soffit, the finish face shall be level within 1/2 inch over 10 feet.
   4. Lay in Ceilings: Where partitions attach to lay-in ceiling grid, the grid shall be level within 1/4 inch over 10 feet.

B. Verify field or hold-to control dimensions before fabrication of integrated interior assemblies. Coordinate fabrication schedule with construction schedule and progress to avoid delay in the work.

C. Examine all adjoining work including work by others.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

B. Locations to receive integrated interior assemblies shall be inspected for compliance with manufacturers requirements.

C. Survey floor to determine the nature of floor level and determine where special conditions exist beyond manufacturer's standard leveling capabilities of 1-1/2 inch (38mm) total variation in floor level. Prepare sub-floor per Division 03.

D. Field conditions and pre-existing installations by others which may adversely affect installation or exceed the manufacturers limitations shall be corrected before installing walls.

3.3 INSTALLATION

A. General: Install all materials in accordance with manufacturer's instructions based on conditions present and pre-installation meeting.

B. All building services shall be installed and connected to the base building systems by licensed subtrades. All building services shall be inspected by authorized trade representatives and Authority Having Jurisdiction in the presence of a manufacturer representative. Coordinate with all affected parties as required.

C. Doors and frames
1. Install sliding doors plumb, level, square, and in proper alignment.
2. Install doors to close against walls without gaps
3. Install doors to open and close smoothly.
4. Anchor sliding doors securely to supports.

D. Electrical:
1. Electrical testing requirements provided in accordance with Division 26 Electrical.
2. Inspect all electrical installations as part of conventional electrical scope prior to installation of finish panels.
3. Installation sequence as determined by the certified installer and coordinated with the General Contractor based on project conditions.

E. Communications:
1. Communications testing requirements provided in accordance with Division 27 Communications.

F. Mechanical/Plumbing Accommodation:
1. Rough-in of vertical plumbing piping, provided by Division 22, shall be completed prior to the installation of the integrated interior assemblies. Horizontal and flexible plumbing piping is roughed in after assembly of the wall frame.
2. Carrier arms and stanchions at integrated interior assemblies required for the support of plumbing fixtures shall be provided in accordance with division 22 requirements. Coordinate locations and type with integrated interior assemblies' provider.
3. Provide dimensions of the roughed-in piping to the integrated interior assemblies supplier for coordination of the holes through the finish panels.
4. Coordinate installation of mechanical system assemblies with the integrated interior assembly supplier as required by the system

3.4 FIELD QUALITY CONTROL

A. Electrical:
1. All building services shall be inspected by authorized trade representatives and the local building authority prior to installation of finishing panels. Refer to Shop Drawings for location of components incorporated into prefabricated walls.
2. In general, installation locations and dimensions are installed a typical distance from prefabricated wall edges, refer to Shop Drawings for more information.

B. Communications:
1. Install communications systems in accordance with Division 27 requirements.

C. Mechanical/Plumbing:
1. Install plumbing systems in accordance with Division 22 requirements.
2. Install mechanical systems in accordance with Division 23 requirements.

3.5 ADJUSTING

A. Adjust and lubricate hardware for proper operation in accordance with manufacturer's instructions.

B. Doors and Frames
   1. Adjust for smooth and balanced door movement in accordance with manufacturer's instructions.
   2. Adjust and lubricate hardware for proper operation.

3.6 CLEANING

A. Dispose of all waste material in accordance with Division 01 and project's Waste Management Plan.

B. Upon completion of installation clean finishes in accordance with the manufacturer's instructions. Avoid alkaline or abrasive agents. Avoid scratching or marring finishes.

3.7 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.8 DEMONSTRATION

A. Manufacturer's representative will be responsible to provide general product training to the Owner or their outsourced operations team at time of installation as well as conduct a comprehensive training session(s) to convey the methodology, and assembly of the walls to sustain general operational maintenance by the Owner's personnel with clearance over the facilities lifetime.

3.9 FINISH SCHEDULE

A. (ANO-1) Anodized:
   1. Type: Manufacturer Standard
   2. Color: Clear.

B. (PNT-01) ChromacoatPlus Paint:
   1. Type: Color Match.
   2. Manufacturer: Sherwin Williams.
   3. Color Name: 7631 City Loftt.
   4. Notes: As indicated on drawings.

C. (PNT-02) ChromacoatPlus Paint:
   1. Type: Color Match.
   2. Manufacturer: Sherwin Williams.
   3. Color Name: 7674 Peppercorn.
   4. Notes: As indicated on drawings.

D. (PNT-03) ChromacoatPlus Paint:
   1. Type: Color Match.
   2. Manufacturer: Sherwin Williams.
   3. Color Name: 6871 Positive Red.
   4. Notes: As indicated on drawings.

E. (THRM-1) Thermofoil:
   1. Manufacturer: SSI
   2. Color Name: Linear Black.
   3. Grain Direction: Horizontal
   4. Notes: As indicated on drawings.

F. (THRM-2) Thermofoil:
   1. Manufacturer: SSI
   2. Color Name: Canadian Grey Super Matte.
   3. Grain Direction: Horizontal
   4. Notes: As indicated on drawings.

G. (THRM-3) Thermofoil:
   1. Manufacturer: SSI
   2. Color Name: Black.
   3. Grain Direction: Horizontal
   4. Notes: As indicated on drawings.

H. (PWD-1): Powder Coat
   1. Type: Manufacturer Standard.
   2. Texture: Textured
   3. Color Manufacturer: DIRTT.
   4. Color Name: Black.
   5. Notes: As indicated on drawings.

I. (GLS-1) Glass:
   1. Type: Tempered
   2. Color/Finish: Back Painted Color Match.
   3. Thickness: 6mm
   4. Color Manufacturer: Sherwin William.
   5. Color/Finish Name: 6871 Positive Red.
   6. Notes: As indicated on drawings

J. (GLS-2) Glass:
   1. Type: Tempered
   2. Color/Finish: Back Painted Color Match.
   3. Thickness: 6mm
   4. Color Manufacturer: Sherwin William.
   5. Color/Finish Name: 7674 Peppercorn.
   6. Notes: As indicated on drawings

K. (MCF-1): WriteAway
   1. Type: Manufacturers Standard Solid Color.
   2. Color/Pattern Manufacturer: DIRTT.
   3. Color: Slate Grey
   4. Sheen: Gloss
   5. Notes: As indicated on drawings

L. (MCF-2): WriteAway
   1. Type: Manufacturers Standard Solid Color.
   2. Color/Pattern Manufacturer: DIRTT.
   3. Color: Slate Grey
   4. Sheen: Matte
   5. Notes: As indicated on drawings

M. Graphics Allowance
   1. Team Room Entrance
   2. Team Room Corridor
   3. Team Room Interior

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 14 65 00

JIB CRANES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Jib cranes.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Include installation instructions and details.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Jib Crane: Type “OZ1000DAV” by Oz Lifting Products, LLC including pedestal mounted base. Manual winch shall be of the brake winch type, utilizing a Weston style load holding brake, a quick-disconnect removable handle, bronze bearings, and available drill-driven option. Included are steel cable, hook and Headache Ball. Floor bolts by contractor.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate installation of jib crane to be attached to or recessed into concrete and furnish anchoring devices with templates, diagrams and instructions for their installation.

3.2 INSTALLATION

A. General: Comply with manufacturer's detailed instructions for the installation of jib crane.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 21 01 00

FIRE PROTECTION OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Compilation product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare operating and maintenance data as specified.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit three copies of complete manual in final form.

1.2 SUBMITTALS

A. Thirty (30) days after the Contractor has received the final scheduled identified submittals bearing the Architect / Engineer's stamp of acceptance (including resubmittals), submit for review one copy of the first draft of the Operating and Maintenance Manual. This copy shall contain as a minimum:
1. Table of Contents for each element.
2. Contractor information.
3. All submittals, coordination drawings and product data, reviewed by the Architect / Engineer; bearing the Architect / Engineer's stamp of acceptance. (When submittals are returned from Engineer "Correct as Noted", corrected inserts shall be included.)
4. All parts and maintenance manuals for items of equipment.
5. Warranties (without starting dates)
6. Certifications that have been completed. Submit forms and outlines of certifications that have not been completed.
7. Operating and maintenance procedures.
8. Form of Owner's Training Program Syllabus (including times and dates).
9. Control operations/equipment wiring diagrams.
10. Other required operating and maintenance information that are complete.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit completed manuals in final electronic form to the Architect / Engineer one day after substantial completion, and prior to Owner's instructions. Include all specified data, test and balance reports, drawings, dated warranties, certificates, reports, along with other materials and information.

D. The Architect / Engineer will review the manuals for completeness within fifteen (15) days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Architect / Engineer. The manuals will not be retransmitted.

F. Complete electronic manuals will be delivered to the Owner.

PART 2 - PRODUCTS

2.1 BINDERS

A. Commercial quality black three-ring binders with clear overlay plastic covers.

B. Minimum ring size: 1"; Maximum ring size: 3".

C. When multiple binders are used, correlate the data into related groupings.

D. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals:
1. Prepare data in form of an instructional manual for use by Owner's personnel.
2. Format:
   a. Size: 8-1/2" x 11".
   b. Text: Manufacturer's printed data or neatly typewritten.
3. Drawings:
   a. Provide reinforced punched binder tab and bind in text.
   b. Fold larger drawings to size of text pages.
4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
   a. Title of Project
   b. Identity of separate structures as applicable.
   c. Identity of general subject matter covered in the manual.
6. Binder as specified.

B. Content of Manual:
1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
   a. Contractor, name of responsible principal, address and telephone number.
   b. A list of each product required to be included, indexed to content of the volume.
   c. List with each product, name, address and telephone number of:
      1) Subcontractor or installer
      2) Maintenance contractor as appropriate
      3) Identify area of responsibility of each
      4) Local source of supply for parts and replacement
   d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
   a. Include those sheets pertinent to the specific product
   b. Annotate each sheet to:
      1) Identify specific product or part installed
      2) Identify data applicable to installation
      3) Delete references to inapplicable information. (All options not supplied with equipment shall be marked out indicated in some manner.
3. Drawings:
   a. Supplement product data with drawings as necessary to illustrate:
      1) Relations of component parts of equipment and systems
      2) Control and flow diagrams

b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
c. Do not use Project Record Documents as maintenance drawings.

4. Written text, as required to supplement product data for the particular installation:
   a. Organize in consistent format under separate headings for different procedures.
   b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued.
   a. Provide information sheet for Owner's personnel, giving:
      1) Proper procedures in event of failure
      2) Instances that might affect validity of warranties or bonds
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems.
1. Content for each unit of equipment and system as appropriate:
   a. Description of unit and component parts
      1) Function, normal operating characteristics, and limiting conditions
      2) Performance curves, engineering data and tests
      3) Complete nomenclature and commercial number of replaceable parts.
   b. Operating procedures:
      1) Start up, break-in, routine and normal operating instructions.
      2) Regulation, control, stopping, shut down and emergency instructions.
      3) Summer and winter operating instructions.
      4) Special operating instructions.
   c. Maintenance procedures:
      1) Routine operations
      2) Guide to trouble-shooting.
      3) Disassembly, repair and reassembly.
      4) Alignment, adjusting and checking.
      5) Routine service based on operating hours.
   d. Servicing and lubrication schedule. List of lubricants required.
   e. Manufacturer's printed operating and maintenance instructions.
   f. Description of sequence of operation by control manufacturer.
   g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
      1) Predicted life of part subject to wear.
      2) Items recommended to be stocked as spare parts.
   h. As installed control diagrams by controls manufacturer.
   i. Complete equipment internal wiring diagrams.
   j. Each Contractor's coordination drawings.
   k. As installed color coded piping diagrams.
   l. Charts of valve tag number, with location and function of each valve.
   m. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
   n. Other data as required under pertinent sections of the specifications.
2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications.
4. Provide complete information for products specified in Division 21.
5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.

8. Provide training report and certificates.
9. Provide backflow preventer certified test reports.

END OF SECTION

SECTION 21 05 00

FIRE PROTECTION GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions and Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 21 Fire Sprinkler Systems.

B. Applicable provisions of this section apply to all sections of Division 22, Plumbing.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Plumbing work shall comply with applicable inspection services:
1. Underwriters Laboratories
2. National Fire Protection Association
3. State Health Department
4. Local Municipal Building Inspection Department
5. Texas Department of Licensing & Regulations (TDLR)
6. Texas Accessibility Standards (TAS Based on ADA)

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A licensed specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that has served their Owners satisfactorily for not less than 3 years

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract

drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.

B. At the conclusion of project, obtain without cost to the Owner, erasable mylars of the original drawings and transfer as-built changes to these. Prior to transmittal of corrected drawings, obtain 3 sets of blue-line prints of each drawing, regardless of whether corrections were necessary and include in the transmittal (2 sets are for the Owner's use and one set is for the Architect/Engineer's records). Delivery of these as-built prints and reproducibles is a condition of final acceptance. Provide record drawings on one set each (reproducible Dayrex mylar film positives) and AutoCad 2012 / Revit CAD files on disk (CD Rom).

C. As-Built drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
2. Remove Engineer’s seal, name, address and logo from drawings.
3. Mark documents RECORD DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY
5. Indicate all changes to construction during construction. Indicate actual routing of all piping, etc. that were deviated from construction drawings.
6. Correct schedules to reflect (actual) equipment furnished and manufacturer.
7. During the execution of work, maintain a complete set of drawings and specifications upon which all locations of equipment, ductwork, piping, devices, and all deviations and changes from the construction documents in the work shall be recorded.
8. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and plumbing valves.
9. Exact location of all electrical equipment in and outside of the building.
10. Fire Protection System documents revised to indicate exact location of all sprinkler heads and zone valves.
11. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
12. Cloud all changes.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect/Engineer, the exact location of all items.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the

like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

1.10 GUARANTEE

A. Guarantee work for 1 year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 21 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

1.14 OPERATING TESTS

A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect/Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.15 WARRANTIES

A. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.16 BUILDING CONSTRUCTION

A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 OPENINGS

A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other

divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.2 HOUSEKEEPING PADS

A. Provide equipment housekeeping pads under all floor mounted and ground mounted plumbing equipment, and as shown on the drawings.

B. Concrete work as specified in Division 3.

C. Concrete pads:
1. 4" high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings
2. Chamfer strips at edges and corner of forms.
3. Smooth steel trowel finish.
4. Doweled to existing slab

D. Install concrete curbs around multiple pipe penetrations.

3.3 VANDAL RESISTANT DEVICES

A. Provide a handle for each loose keyed operated valve and hose bibb on the project.

B. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used.

C. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.4 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the plumbing systems.
1. Provide the training during the Owner's regular working day.
2. The instructors shall each be experienced in their phase of operation and maintenance of building plumbing systems and with the project.

B. Time to be allocated for instructions.
1. Minimum of 4 hours dedicated instructor time.
2. 2 hours on each of 2 days.

C. Before proceeding with the on-site training program, submit the program syllabus; proposed time and dates; and other pertinent information for review and approval.
1. One copy to the Owner.
2. One copy to the Architect/Engineer.

D. The Owner will provide a list of personnel to receive instructions, and will coordinate their attendance at the agreed upon times.

E. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of the training program that instructions have been satisfactorily completed. Give time and date of each demonstration and hours devoted to the demonstration, with a list of people present.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.5 EQUIPMENT IDENTIFICATION

A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
   1. Designation approved by Architect/Engineer.
   2. Equipment includes, but is not limited to, water heaters, pumps, boilers and utility controllers.
   3. Submit schedule of equipment to be included and designations.

B. Provide nameplates with 1/2" high letters and fastened with epoxy or screws.

3.6 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
   1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
   2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.7 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

END OF SECTION

SECTION 21 05 10

FIRE PROTECTION CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples. All exposed finishes shall be approved by the Architect. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide qualified personnel to observe:
1. Field conditions.
2. Condition of installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Testing, adjusting, and balancing of equipment.

B. Representative shall make written report of observations and recommendations to Architect / Engineer.

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS.

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to the project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather will be rejected, and the Contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

B. Adequately protect equipment from damage after delivery to the project. Cover with heavy tarpaulins, drop cloths or other protective coverings as required to protect from plaster, paint, mortar and/or dirt. Do not cover with plastic materials and trap condensate and cause corrosion.

END OF SECTION

SECTION 21 05 12

FIRE PROTECTION SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 1.

B. The term submittal, as used herein, refers to all:
1. Shop Drawings
2. Coordination Drawings
3. Product data

C. Submittals shall be prepared and produced for:
1. Distribution as specified
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relationship to adjacent features, critical features, work, or products.

D. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: ¼” = 1’-0”.

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each mechanical room and for each outside equipment pad where equipment is located, submit plan and elevation drawings. Show:
1. Actual mechanical equipment and components to be furnished
2. Service clearance
3. Relationship to other equipment and components
4. Roof drains and leader piping
5. Fire protection piping and equipment

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Related requirements:
1. Ductwork shop drawings
2. Coordination drawing specified in Division 26

F. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

G. Gas piping sketch indicating proposed location of piping prior to proceeding with the installation.

1.4 PRODUCT DATA AND INSTALLATION INSTRUCTION

A. Submit only pages which are pertinent to the project. All options which are indicated on the product data shall become part of the contract and shall be required whether specified are not.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: “Comply, ”Do Not Comply”, or “Not Applicable”. Explain all “Do Not Comply” statements.

F. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Manufacturer's catalog numbers
4. Conformance with requirements of Contract Documents

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect / Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect / Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
1. Proper sizes and capacities
2. That the item will fit in the available space in a manner that will allow proper service
3. Construction methods, materials and finishes

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
   1. Shop Drawings and Coordination Drawings: Submit one reproducible transparency and three opaque reproductions.
   2. Product Data: Submit the number of copies which the contractor requires, plus those which will be retained by the Architect / Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name and address
   4. The number of each Shop Drawing, Project Datum and Sample submitted
   5. Other pertinent data

D. Submittals shall include:
   1. The date of submission
   2. The project title and number
   3. Contract Identification
   4. The names of:
      a. Contractor
      b. Subcontractor
      c. Supplier
      d. Manufacturer
   5. Identification of the product
   6. Field dimensions, clearly identified as such
   7. Relation to adjacent or critical features of the work or materials
   8. Applicable standards, such as ASTM or federal specifications numbers
   9. Identification of deviations from contract documents
   10. Suitable blank space for General Contractor and Architect / Engineer stamps
   11. Contractor's signed and dated Stamp of Approval

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
   1. Finishes which involve Architect / Engineer selection of colors, textures or patterns
   2. Associated items which require correlation for efficient function or for installation

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number
   2. The exact specification section title

B. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make re-submittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a re-submittal
   2. Identify changes made since previous submittals

B. Indicate any changes which have been made, other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect / Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect / Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect / Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT / ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect / Engineer will:
1. Review identified submittals with reasonable promptness and in accordance with schedule
2. Affix stamp and initials or signature, and indicate requirements for re-submittal or approval of submittal
3. Return submittals to Contractor for distribution or for resubmission

B. Review and approval of submittals will not extend to design data reflected in submittals which is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review and approval is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Div. 1.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 21 05 13

ELECTRICAL PROVISIONS OF FIRE PROTECTION WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical provisions to be provided as fire protection work are indicated in other Division 21 sections, on drawings, and as specified.

B. Types of work, normally recognized as electrical but provided as fire protection, specified or partially specified in this Section, include but are not necessarily limited to the following:
1. Motors for fire protection equipment.
2. Starters for motors of fire protection equipment, but only where specifically indicated to be furnished integrally with equipment.
3. Wiring from motors to disconnect switches or junction boxes for motors of fire protection equipment, but only where specifically indicated to be furnished integrally with equipment.
4. Wiring of field-mounted float control switches, flow control switches, and similar fire protection-electrical devices provided for fire protection systems, to equipment control panels.
5. Pipe heat tracing.

C. Refer to Division 21 sections for specific individual fire protection equipment electrical requirements.

D. Refer to Division 26 sections for motor starters and controls not furnished integrally with fire protection equipment.

E. Refer to Division 26 sections for junction boxes and disconnect switches required for motors and other electrical units of fire protection equipment.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to work of this Section.

1.3 QUALITY ASSURANCE

A. Wherever possible, match elements of electrical provisions of fire protection work with similar elements of electrical work specified in Division 26 sections for electrical work not otherwise specified.

B. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.4 SUBMITTALS

A. Include in listing of motors, voltage, notation of whether motor starter is furnished or installed integrally with motor or equipment containing motors.

PART 2 - PRODUCTS

2.1 MOTORS

A. Provide motors for fire protection equipment manufactured by one of the following:
1. Baldor Electric Company.
2. Century Electric Div., Inc.
3. General Electric Co.
4. Louis Allis Div.; Litton Industrial Products, Inc.

5. Lincoln Electric
6. Marathon Electric Mfg. Corp.
7. Reliance Electric Co.
8. Westinghouse Electric Corp.

B. Motor Characteristics. Except where more stringent requirements are indicated, and except where required items of fire protection equipment cannot be obtained with fully complying motors, comply with the following requirements for motors of fire protection work:

C. Temperature Rating. Rated for 40°C environment with maximum 50°C temperature rise for continuous duty at full load (Class A Insulation).

D. Provide each motor capable of making starts as frequently as indicated by automatic control system, and not less than 5 starts per hour for manually controlled motors.

E. Phases and Current Characteristics. Provide squirrel-cage induction polyphase motors for 3/4hp and larger, and provide capacitor-start single-phase motors for 1/2hp and smaller, except 1/6hp and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division 26 sections, and with individual equipment requirements specified in other Division 21 requirements. For 2-speed motors provide 2 separate windings on polyphase motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.

F. Service Factor. 1.15 for polyphase motors and 1.35 for single-phase motors.

G. Motor Construction. Provide general purpose, continuous duty motors, Design "B" except "C" where required for high starting torque.
1. Frames. NEMA #56.
2. Bearings are to be ball or roller bearings with inner and outer shaft seals, regreasable except permanently sealed where motor is inaccessible for regular maintenance. Where belt drives and other drives produce lateral or axial thrust in motor, provide bearings designed to resist thrust loading. Refer to individual section of Division 21 for fractional-hp light-duty motors where sleeve-type bearings are permitted.
3. Except as indicated, provide open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and provide guarded drip-proof motors where exposed to contact by employees or building occupants. Provide weather-protected Type I for outdoor use, Type II where not housed. Refer to individual sections of Division 21 for other enclosure requirements.
4. Provide built-in thermal overload protection and, where indicated, provide internal sensing device suitable for signaling and stopping motor at starter.
5. Noise Rating: Provide "Quiet" rating on motors.

H. All motors shall be premium efficiency.

2.2 EQUIPMENT FABRICATION

A. Fabricate fire protection equipment for secure mounting of motors and other electrical items included in work. Provide either permanent alignment of motors with equipment, or adjustable mountings as applicable for belt drives, gear drives, special couplings and similar indirect coupling of equipment. Provide safe, secure, durable, and removable guards for motor drives. Arrange for lubrication and similar running-maintenance without removal of guards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motors on motor mounting systems in accordance with motor manufacturer’s instructions, anchored to resist torque, drive thrusts, and other external forces inherent in fire protection work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Verify voltage with Electrical Plans.

END OF SECTION

SECTION 21 10 00

FIRE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Design coordination of sprinkler work with the installations of other trades as shown on their drawings; all mechanical, electrical, plumbing and sprinkler work must fit the space requirements. The sprinkler work shall comply with other Sections of this specification; and fit the structure finishes. The Sprinkler Contractor will comply with all the codes and underwriter authorities, and the requirements for the installation of inside and outside piping; including sprinkler heads, valves, tamper switches, flow switches, hangers and supports, sleeves, fire department connections, inspector test connections, main drain and accessories, signs, and any other component parts reasonably incidental to providing a complete protection system. Provide 100 percent coverage for the entire building.

B. A wet system shall be installed in heated areas and dry pipe systems in areas subject to freezing. When heated areas are not available and dry pipe system not used, provide heat tracing and / or insulation installed per NFPA and per local Fire Marshall Requirements, or as indicated on drawings.

C. Furnish all articles of a completed sprinkler system including all materials, labor, tools, equipment, transportation services and supervision fees.

D. The plans provide a riser assembly location at water entry into building for flow switch locations, valve locations (with tamper switches), fire department test assemblies and fire department Siamese connections. These are a guide for subsequent preparation of the Contractor’s detailed installation drawings of the complete fire protection sprinkler system which shall be submitted to the Architect / Engineer for review. Submit only drawings and calculations bearing the approval of the authority having jurisdiction.

E. Do not exceed 52,000 square feet of building for each individual sprinkler system.

F. Install fire protective system identification signs in accordance with NFPA-13, NFPA-14, and NFPA-20

G. It shall be the fire protection installer’s responsibility to verify pressure at the project site by performing a flow test. Determine if the available static pressure, residual pressure, and flow rate will adequately provide the fire extinguishing system with the necessary operating requirements or if a fire pump, storage tank and necessary appurtenances are required. Notify Architect and Engineer if low water flow / pressure condition exist and inform them of all options prior to proceeding.

H. The installation of the entire Sprinkler Systems shall comply with all rules and regulations of the National Board of Fire Underwriters, the Local Building Code, Local Fire Marshall, and Requirements of NFPA Pamphlet 13, and other local authorities exercising jurisdiction.

I. Study the general, structural, electrical, and mechanical drawings and specifications, in order to become familiar with the building and details as they apply to the work of this Section. Cooperate with all Trades so that there will be no conflict of space. Plumbing flow lines, large ductwork HVAC piping and electrical service feeders shall take precedence over Fire Protection work, except where it is absolutely necessary to maintain coverage protection.

J. Provide a water curtain sprinkler system along glazing to create a 1-hour rating, as outlined in NFPA 13. Refer to Architecture plans for locations. Water demand for water curtain shall be added to the ceiling sprinkler water demand at the point of connection, per NFPA 13. Sprinkler heads shall be spaced at 6’-0” o.c., minimum 6 inches and maximum 12 inches from glazing.

1.2 BASIS OF DESIGN

A. National Fire Protection Association (NFPA), latest edition of NFPA 13, Standard for the Installation of Sprinkler Systems.

B. Vertical zone valves installed in horizontal position are not acceptable. All zone valves are to be located at water entry into building and mounted in the vertical riser.

1.3 QUALITY ASSURANCE

A. Sprinkler equipment and installation to be in accordance with recommendations of and approved by local, state, and federal fire authorities.

B. Equipment and installation to meet requirements of NFPA No. 13, 14, 20, 24, 25, 70 and 72.

C. Use materials and equipment that are new and of unused, approved by NFPA and as listed in the UL list of "Inspected Fire Protection Equipment and Materials."

1.4 SHOP DRAWINGS

A. Make complete shop drawings and working drawings of equipment furnished, including detailed drawings of piping and sprinkler head locations. Drawings shall show construction details and dimensions of each piece of equipment and work to be installed. The location of all heads shall be as approved. Where additional heads are required to meet NFPA 13, provide at no additional cost.

B. Before the shop drawings are submitted to Architect / Engineer, submit drawings to the jurisdictions for approval. All approvals shall be noted on the drawings or by letter from the departments.

C. The Architect's approval of shop drawings shall not relieve the responsibility of correctly figured dimensions or any errors that may be contained in these drawings. The omission of any material shown on the contract drawings, or specified from the shop drawings, even though approved, shall not relieve the responsibility to furnish and erect them.

D. Provide ¼ scale drawings to show the location of the water entry into building with all zone valves, and shut-off valves, with alarms and drains at this location. Prepare the sprinkler drawings under the work of this Section.

E. Submit samples of all sprinkler types for approval.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Johnson Controls (Tyco Fire Products)
   1. Gem/Grinnell
   2. Central
   3. Star Sprinkler

B. Automatic Sprinkler Company of America

C. Potter Roemer, Inc.

D. The Reliable Automatic Sprinkler Company

E. Viking Corporation

F. Victaulic Company of America

G. Globe Fire Sprinkler Corporation

2.2 PIPING AND FITTINGS

A. Above Slab Inside Building
   1. Pipe 2" and Smaller: Schedule 40, black steel pipe conforming to ASTM A 795 or ASTM

A135 joined with threaded fittings.

2. Pipe 2-1/2" and larger, provide ASTM A795 or ASTM A135 UL and FM listed.
   a. Schedule. 40, black steel pipe joined with rolled grooved fittings.

B. Underground within five feet of building. Provide ductile iron pipe, Class 200 conforming to ASTM, and ring-tite fittings. Provide concrete thrust blocks at changes in direction, according to the pipe manufacturer's recommendations.

C. All piping shall be black carbon steel, except in dry systems where pipe shall be galvanized per ASTM A53.

D. Fittings used to join pipe shall be listed fabricated fittings or manufactured in accordance with the material and dimension standards listed in table 6.4.1 NFPA 13 and 2.2.1 NFPA 14.

2.3 SPRINKLER HEAD

A. All sprinklers shall comply with the latest requirements of NFPA 13 with respect to orifice size.

B. All heads shall be UL listed and/or FM approved and comply with the latest requirements of NFPA 13 with respect to orifice size unless otherwise noted. Sprinkler heads with “O” ring design shall not be acceptable.

C. Exposed areas:
1. Standard upright type with brass finish and escutcheon. Provide temperature rating per NFPA 13 and UL/FM approvals.
2. Tyco Model B, FRB, Globe Model GL-QR, GL-SR, or approved equal

D. Sidewall applications:
1. Horizontal sidewall type with brass finishes and chrome escutcheon.
2. Unfinished areas and recessed with chrome plated escutcheon. Provide temperature rating per NFPA 13 and UL/FM approvals.
3. Tyco Model B, FRB, Globe Model GL-QR/SW, GL-SR/SW, or approved equal.

E. Suspended ceilings:
1. Adjustable drop-down deflector type concealed heads with manufacturer painted white cover plate with glass bulb fusible link. Provide temperature rating per NFPA 13 and UL/FM approvals.
2. Color of plate, selected by Architect
3. Tyco Series RFII; Series ELOC, Globe Concealed Models GL-QR/INCH, GL-SW/INCH and GL-INCH/ECLH or approved equal.

F. Dry sprinklers heads at freezers and coolers
1. Tyco Model DS-1, DS-2, or approved equal.

G. Sprinklers subject to mechanical injury shall be protected with fusible solder type sprinklers and listed heavy duty bolt on guards. Bulb type sprinklers will not be acceptable for these locations.
1. Storage rooms with exposed structure.
2. Gymnasiums.
3. Mechanical and Electrical rooms.
4. Below exposed stairs.
5. Exposed structure areas.

H. Systems serving walk-n freezers shall utilize Tyco Model DS-1 or DS-C dry pendent sprinklers. A Model DSB-1 dry sprinkler boot shall be utilized in conjunction with the dry sprinkler to eliminate the requirement for insulation and to stop potential air interchange. Length of dry pendent shall be determined by manufacturer’s recommendation with respect to freezer ambient temperatures expected.

2.4 INSPECTOR’S TEST CONNECTION

A. Provide inspector’s test connection as required by NFPA 13.
1. Ductile iron module housing with combination sight glass, orifice, and bonnet assembly

2. UL listed
3. Victaulic No. 718
4. Globe Model UTD
5. Tyco, or approved equal

2.5 TAMPER SWITCH / SUPERVISORY SWITCH

A. Tamper switch on each valve
1. Controlling or shutting off sprinkler system or any portion thereof.
2. Tamper switch with either one single pole, double throw switch or two single pole, double throw switches as required.
3. Switch shall be compatible with installed valve for standard mounting.
4. Potter-Roemer Fig. 6220, 6221, 6222, 6223 or approved equal.

2.6 FLOW SWITCH

A. Vane type flow switch.
1. Self-contained pneumatic, adjustable retard.
2. Two, single pole, double throw switches.
3. Red enamel tamper proof switch housing with flow paddle.
4. Potter Roemer Model No. 6200 or approved equal.

2.7 FLOORS AND CEILING PLATES

A. Provide chrome-plated floor and ceiling plates around pipes exposed to view when passing through walls, floors, partitions, or ceilings in finished areas; size plates to fit pipe or insulation and lock in place.

2.8 DOMESTIC MANUFACTURE

A. All piping material, pipe and pipe fittings shall be manufactured in the United States of America.

2.9 DRY PIPE SYSTEM

A. General: Provide a UL listed, and FM approved dry pipe system at areas subject to freezing. System shall consist of a dry pipe valve, air compressor, fusible link type sprinkler heads and all associated trim and piping for a complete operating system.

B. Dry Pipe Valve: Rated for a working pressure of 175 psi, factory hydrostatic tested at 350 psi, supplied with all gauges, valves, strainer, electrical alarm switch, ball drip valve, and drip cup assembly, manufactured by Victaulic Model 756, Globe Model RCW.

C. Air Compressor: Oilless, permanently lubricated, pipe mounted, direct drive, complete with safety relief valve manufactured by Reliable Model A or approved equal. Size of air compressor is determined by volume of dry pipe system. Coordinate power requirement with electrical contractor. Coordinate all wiring required with Fire Alarm System.

D. If the dry pipe system is not used in conjunction with a wet pipe system containing the necessary check valves or backflow preventer, a check valve shall be installed in the dry pipe system at the connection to the water supply.

E. If the dry pipe system is not used in conjunction with a wet pipe system containing a control valve such as a post indicator (PIV) or outside screw & yoke valve (OS&Y), a PIV or OS&Y shall be installed in the system.

F. The dry pipe valve and pipe to the wet supply shall be protected from freezing.

G. Provide an automatic or manual compressed air system capable of restoring normal air pressure to a system in 30 minutes or less.

H. Provide an accelerator when system capacity exceeds 500 gallons.

I. Provide a water motor alarm or electric pressure switch.

J. Provide dry pipe valve trim and pressure gauges.

K. Dry pipe system shall be hydraulically calculated for the hazard being protected.

L. Provide dry pendent type sprinkler heads only when the piping and sprinklers are not in a heated area.

M. Provide a test drain valve sized per NFPA. An inspector's test shall be provided at each system.

N. Slope all piping toward a drain per NFPA 13. A drain shall be provided at all low points.

O. The following accessories shall be provided where required:
1. Victaulic Series 756.
2. Viking Model E dry pipe valve with conventional trim.
3. Viking Model D-1 accelerators.
4. Globe Model RCW dry pipe valve with conventional trim package, and Model C Accelerator.

2.10 GASKETS

A. Use 1/16-inch-thick preformed synthetic rubber bonded.

2.11 COUPLINGS

A. Use listed rolled grooved mechanical couplings to engage and lock grooved, or shouldered pipe ends and to allow for some angular deflection, contraction, and expansion. Coupling consists of ductile iron housing, c-shaped composition sealing gasket and steel bolts. Gasket Material for dry pipe systems shall be silicone and listed for dry pipe service.

2.12 VALVES

A. Use valves suitable for 175 psig WOG.

B. Valves to be UL listed and FM approved.

C. Valve Connections:
1. Provide valves suitable to connect adjoining piping as specified for pipe joints. Use full line size valves unless noted otherwise.
2. Screwed ends for pipe sizes 2 inches and smaller.
3. Flanged ends for pipe sizes 2-1/2 inches and larger.
4. Solder or screw to solder adapters for copper tubing.
5. Use grooved body valves with mechanical grooved jointed piping.

D. Gate Valves:
1. Up to 2 inches, bronze, outside screw and yoke, rising stem, solid wedge, screwed ends, manufactured by: Mueller, or approved equal.
2. Over 2 inches, iron body, bronze trim, outside screw and yoke, rising stem, solid wedge, flanged ends; manufactured by Mueller, or approved equal.

E. Check Valves:
1. Up to 2-inch, bronze, regrind bronze swing disk, solder, or screwed ends; 200 WOG, manufactured by Mueller, or approved equal.
2. Over 2-inch, iron body bronze trim, swing disk, regrind – renew bronze disk and seat, flanged ends; 200 WOG, manufactured by Mueller, Globe Model RCV, or approved equal.

F. Butterfly Valve: Lug body style, bubble-tight shutoff, cast iron body, ASTM B 148 bronze disk, with integral tamper switch, manufactured by Anvil Model No. 8000 FP, or approved equal.

G. Freestanding Indicating Post: Install adjustable indicating post and valve outside building where shown on Civil drawings, consisting of UL/FM, non-rising stem gate valve and indicating post. Gate

valve shall be iron body, non-rising stem, bronze mounted. Indicator flange, 175-psi non-shock rating, flanged end. Indicator shall be UL/FM approved cast iron body, Plexiglas window and 18-inch adjustment span with handle and tamper switch wired to main fire alarm control panel, manufactured by Mueller, Valve No. A-2052, Indicating Post No. A20800, or approved equal.

H. Wall post-adjustable indicating valve: Outside building at water entry location into building, consisting of UL/FM, non-rising stem gate valve and indicator. Gate valve shall be iron body, non-rising stem, bronze mounted. Indicator flange, 175-psi non-shock rating, flanged end. Indicator shall be UL/FM approved cast iron body, Plexiglas window and 18-inch adjustment span with handle and tamper switch wired to main fire alarm control panel, manufactured by Mueller, Valve No. A-2052, Indicating Post No. A20800, or approved equal.

2.13 ELECTRIC ALARM BELL

A. 10-inch round red enamel steel bell with electrically operated vibrating outdoor alarm bell, UL listed, red enamel steel, manufactured by Simplex, or approved equal.

2.14 GAUGES

A. Gauges shall be bourdon tube type with minimum 4-1/2-inch dial and die cast aluminum case with screwed ring and black enamel finish. The movement shall be all stainless steel with Grade A phosphor bronze bourdon tube, brazed at socket and tip. The accuracy of the gauge shall be within one-half of one percent of the scale range. The pointer shall be the micrometer adjustment type recalibrated from the front. Pressure and compound gauges shall have suitable scale ranges and graduations. Suitable for temperatures up to 120 degrees F.

B. Gauges shall have ¼ inch connections and be mounted with combination stop / snubber needle valve with suitable pressure rating. Scale ranges: 0-200 psi.

C. Gauge range shall be such that system normal operating pressure falls with 25 percent and 75 percent of the full-scale range.

D. Pressure scale graduations shall read in psig. Figure intervals shall be in – 20 psig increments, with minor divisions in 2 psig increments.

E. The accuracy of the gauge shall be at least 0.5 percent of the scale range. Gauge shall be made in accordance with ASME B40.1 accuracy grade 2A.

F. Manufactured by:
1. Trerice Model No. 4500 Series
2. Ashcroft
3. Marsh
4. Weksler

2.15 SPARE SPRINKLER HEAD BOX

A. Provide baked enamel steel box to store 36 sprinkler heads (Minimum of 3 of each type used) for emergency replacement. Provide sprinkler wrench.

2.16 ALARM CHECK VALVE

A. Provide UL listed check valve.
1. Variable for City Supplied systems pressure trim set.
2. Constant for Fire Pump Systems pressure trim set.
3. Tyco AV-1, Globe Model H, or approved equal.

2.17 WATER MOTOR ALARM

A. Provide a red enamel motor alarm for installation on exterior wall.
1. Tyco Model WMA-1, Globe Model WM, or approved equal.

2.18 SIAMESE FIRE DEPARTMENT CONNECTION

A. Siamese Wall mounted chrome-plated Siamese. Include caps, sillcock, chain, and a plate lettered AUTO-SPKR.
   1. Provide a 4" X 2-1/2" x2-1/2".
   2. Potter-Roemer #5751

PART 3 - EXECUTION

3.1 DESIGN

A. Design, spacing of sprinkler heads and selection sizes shall conform to the requirements of NFPA 13 for the indicated occupancy.

B. Uniform discharge density design shall be based on hydraulic calculations using the method outlined in NFPA 13. Density of discharge from sprinkler heads shall conform to NFPA 13.

C. Friction losses in pipe will be based on a value of “C” = 120 in the Hazen and Williams formula.

D. Design and install the system so that no part will interfere with doors, windows, heating, mechanical, lighting, or electrical equipment. Do not locate sprinkler heads closer than 3 feet to lighting fixtures or other obstructions.

3.2 LOCATION

A. Heads shown, if indicated on reflected ceiling plans, are an integral part of the ceiling design. Where heads are not shown or indicated, locate them in the exact center of acoustical ceiling tile unless noted otherwise. In rooms with monolithic plaster or gypsum drywall ceilings, locate the sprinkler heads symmetrically arranged with respect to both axes of the room. Locate sprinkler heads in relation to specialty ceiling elements such as slats, ribs, panels, grids, etc., if not shown on the drawings. Generally, locate heads in the exact center of, or spaced between, such elements. Center heads in corridors.

B. Locate heads as may be required for coordinated ceiling pattern, even through number of heads exceed minimum code requirements.

C. Sprinkler heads located in utility or mechanical rooms, penthouses, service corridors, or other such spaces not subject to public view need not be centered in ceiling patterns and may use a straight drop from branch line.

D. Install a water curtain sprinkler system along glazing to create a 1-hour rating, as outlined in NFPA 13. Refer to plans for locations. Water demand for water curtain shall be added to the ceiling sprinkler water demand at the point of connection, per NFPA 13. Sprinkler heads shall be spaced at 6’-0” on center, minimum 6 inches and maximum 12 inches from glazing.

E. Where glazing shall be installed in 2-hour fire rated assemblies, the Tyco Window sprinkler shall be utilized as outlined in the ICC Legacy report equivalency requirements. Any glazing requiring fire exposure protection shall also utilize the Tyco window sprinklers.

3.3 PREPARATION

A. Ream pipes and tubes, clean off scale, rust, oxide, and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

B. Pipe beveled each end, per approved procedures.

C. Hammer clean and flush out piping after welding to remove scale, welding slag and other debris.

3.4 CONNECTION

A. Make screwed joints with square, clean full cut standard taper pipe threads. Ream after cutting and threading. Red lead and linseed oil or other approved non-toxic joint compound applied to male

threads only.

B. Nipples: Shoulder type; extra heavy where less than 1-1/2 inch is unthreaded.

C. Clamp cast iron water pipe at fittings with ¾ inch rods and properly anchor and support.

D. Use grooved mechanical couplings and mechanical fasteners only in accessible locations.

3.5 COORDINATION

A. Coordinate the installation schedule for this work with the construction schedule for the Work to ensure orderly progress with minimum delay.

B. Coordinate interface of fire sprinkler system with the work of other trades to ensure proper and adequate provision for the installation and connection of this system.

C. Coordinate location and quantity of Siamese connections required for fire department connection with Architect and local fire officials.

3.6 SURFACE CONDITIONS

A. Before starting each stage of the fire sprinkler systems installation, inspect the installed work of other trades and determine that work is complete enough to allow installation to begin. Ensure that work of other trades has been installed in a manner to permit work of this Section in accordance with approved design.

3.7 INSTALLATION

A. Run piping concealed above furred ceilings and in joists to minimize obstructions. Expose only heads.

B. Protect sprinkler heads against mechanical injury with heavy duty bolt-on guards.

C. Locate system drains and inspector’s test connections in utility rooms, mechanical rooms or other readily accessible areas not requiring access through ceiling. Coordinate sprinkler system drain flow rates with plumbing system drainage capacities.

D. Where low points or drains occur above ceilings or in otherwise finished spaces, furnish drain valve with brass cap and chain.

E. Locate outside alarms on wall of building and coordinate with Architect.

F. Fire pump and all accessories shall be tested in accordance with NFPA 20 and the local Fire Marshall and/or all other authorities having jurisdiction.

G. Provide on interior wall near sprinkler valve, cabinet containing extra sprinkler heads of each type and wrench suitable for each head type.

H. Provide a minimum 18-inch radius swing joint for each drop to sprinkler heads located in ceilings.

I. Provide Easy-Flex or Flexhead Industries sprinkler hose fittings for each sprinkler head installation for hydraulically designed wet, pre-action, deluge, or dry pipe sprinkler connections per NFPA 13. Allow a 3” minimum bend radius per UL.

J. Install pipe markers to identify fire protection.

K. Provide shield or deflector for sprinklers or equipment where electrical switchgear, switchboards and motor control centers are in sprinkler protected spaces.

L. Install fire 2-1/2-inch department valve, maximum 5 feet above floor, complying with NFPA 14.

M. During construction, make one standpipe outlet available on each floor without delay, for fire

department use.

N. Provide 3-way standpipe outlets above roof.

O. Provide pressure gauges at the top of each standpipe as detailed on the drawings.

P. Provide drain for each standpipe.

Q. Install valves with stems upright or horizontal, not inverted.

R. Sprinkler heads shall be installed above and below ductwork over 48 inches wide, in exposed areas, per NFPA 13.

S. Install the complete fire sprinkler system in accordance with the approved shop drawings.

T. Perform piping installation in accordance with the provisions of the specifications, including furnishing of required sleeves for fire sprinkler system pipes passing through rated walls, floors, and other parts of the building. Provide scheduled 40 galvanized pipe sleeve for concrete or CMU penetrations. Furnish size required for fireproofing and or insulation. Furnish and install split wall plates and chrome plated escutcheons for exposed fire sprinkler system pipes. Where pipes pass through concrete floors, furnish, and install wrought iron or steel pipe sleeves made flush with the ceiling below and extending 2" above the finished floor.

U. Do not cut or make holes in any part of the building except where shown on the approved shop drawings.

V. Furnish and install, next to the sprinkler riser main, a print sheet protected by glass or a transparent plastic cover, giving brief instructions regarding control, emergency procedure, and other data required by NFPA #13. For hydraulically designed sprinkler systems, a placard is to be permanently attached to the riser indicating the location, and the basis of design (discharge density and system demand).

W. Do not install exposed piping below structure in public area.

X. Provide heat tracing and insulation on wet piping systems exposed to freezing when not installed in a heated space or installed by other acceptable methods of maintaining the piping from freezing. Installation of heat tracing and insulation shall be in accordance with the latest edition of NFPA 13 and the local code authorities. Coordinate electrical requirements with Division 26.

3.8 SECURING AND SUPPORTING

A. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved adjustable ring type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved adjustable ring type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging.

B. Provide supports both sides of elbows for pipe 6" and larger.

C. Support vertical risers with steel strap pipe clamps of approved design and size, supported at each floor. Support piping assemblies in chases so they are rigid and self-supported before the chase is closed.

D. Support spacing: As recommended by the project structural engineer and support manufacturer, but not more than listed below. Not to exceed spacing requirements of smallest pipe.

Pipe Size	Steel Max. Support Spacing, Feet	Minimum Rod Diameter, Inches
1" & smaller	6	3/8
1-1/4" & 1-1/2"	8	3/8
2"	10	3/8

Pipe Size	Steel Max. Support Spacing, Feet	Minimum Rod Diameter, Inches
3"	10	1/2
4" & 5"	10	5/8
6" and above	10	3/4

3.9 PIPE SUPPORTS

A. Provide P1001 or P 5000 Unistrut metal framing members and appurtenances for pipe support. Hot-dip galvanize members and appurtenances when located outside. Sagging of pipes or supports is not acceptable.

B. Adjustable ring type hangers shall be used for single pipe supports; Erico Model 115 NFPA UL/FM. When oversized clevis is used, a nipple shall be placed over the clevis bolt as a spacer to assure that the lower U-strap will not move in on the bolt. All parts shall be zinc plated carbon steel, or galvanized.

3.10 PIPE SLEEVES

A. Sleeves through masonry and concrete construction:
1. Fabricate sleeves of Schedule 40 galvanized steel pipe.
2. Size sleeve large enough to allow for movement due to expansion and to provide continuous insulation.

B. Sleeves through gypsum wall construction.
1. Fabricate sleeves of 16-gauge galvanized sheet metal.

C. Sleeves through elevated slab construction.
1. Fabricate sleeves of Schedule 40 galvanized steel pipe with welded center flange in floor.

D. Extend each sleeve through the floor or wall. Cut the sleeve flush with each wall surface. Sleeves through floors shall extend 2” above floor lines for waterproofing purposes. Slab on grade floors shall not be sleeved except where penetrating waterproofing membrane or insect control is required.

E. Caulk sleeves water and airtight. Seal annular space between pipes and sleeves with mastic compound to make the space water and airtight.

F. For sleeves below grades in outside walls, provide Thunderline Link-Seal or Advance Product and System Interlynx, with 316 stainless steel nuts and bolts, with cast iron pressure plate.

G. Provide chrome plated escutcheon plates on pipes passing through walls, floors or ceilings exposed to view. At exterior walls, stainless steel sheet metal is to be used.

H. For sleeves through fire and smoke rated walls, seal with a UL through-penetration firestop, rated to maintain the integrity of the time rated construction. Install in accordance with the manufacturer's installation instructions. Comply with UL and NFPA standards for the installation of firestops. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

3.11 CLEANING OF PIPING SYSTEMS

A. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge, and circulate.

3.12 FLUSHING AND TESTING

A. Testing and flushing of installation of sprinkler system shall be in accordance with NFPA 13, and NFPA 25.

B. Flush sprinkler piping in accordance with NFPA 13. Additionally, flush all alarm valves, and all main

piping up to valve.

C. In addition to NFPA 13 required tests, provide flow switch test and tamper switch test for each device, and verify alarm valve operation.

D. All tests shall be witnessed by Architect / Engineer. Contractor shall notify Architect / Engineer 7 working days in advance.

3.13 EXCAVATING, TRENCHING, AND BACKFILLING

A. Perform excavation, trenching, and backfilling for this portion of the work in accordance with the specifications.

3.14 PIPE MARKERS

A. Identify interior exposed piping and piping in accessible chases or plenums with Opti-Code Brady Pressure Sensitive Adhesive Pipe Markers, consisting of pipe marker and direction of flow arrow tape. Clean pipe prior to installation. Background colors of markers, arrows, and tape for each type of system shall be the same. Meet ANSI/OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

B. Identify exterior and mechanical room piping with Snap Around pipe markers through 4-inch pipe and Strap Around markers 5-inch pipe and larger. Pipe markers consisting of pipe marker and direction of flow arrow tape; background colors of markers, arrows, and type for each type of system shall be the same. Meet ANSI / OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

C. Install identification in the following locations:
1. Both sides of penetrations through walls, floors, and ceilings.
2. Close to valves or flanges.
3. Intervals on straight pipe runs not to exceed 50 feet
4. Apply marker where view is obstructed.

D. Pipe markers shall meet or exceed the specifications of the ASME A13.1 “Scheme for Identification of Piping Systems”.

3.15 TESTING AND ACCEPTANCE

A. Prior to connecting to the overhead sprinkler piping, flush the underground main. Secure required approvals of the flushing operations.

B. Upon completion of the fire sprinkler system installation, test and retest the complete installation and make corrections as necessary to obtain acceptance by the Fire Marshall and/or any other authority having jurisdiction. Furnish test equipment and personnel required.

3.16 TRAINING

A. At a time mutually agreed upon, provide 4 hours of instruction to the Owner’s designated personnel on the operation and maintenance of the automatic sprinkler system and associated equipment. Owner’s Operation and Maintenance Manual prepared for this project shall be used during the instruction.

END OF SECTION

SECTION 21 31 13

FIRE PUMP SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide and install one packaged fire pump system, including a horizontal split case, centrifugal fire pump complete with motor, controller, and accessories as outlined.

1.2 RELATED WORK

A. Division 23, Mechanical.

1.3 STANDARDS

A. Make the installation in accordance with applicable requirements of National Fire Protection Association (NFPA) pamphlets, Factory Mutual, and any requirements of state or local authorities.

B. Furnish equipment and materials approved by NFPA and UL.

1.4 REQUIREMENTS

A. The Contractor shall provide and install a packaged fire pump system, designed in accordance with the requirements of NFPA Pamphlet #20. The system manufacturer will assume unit responsibility for the proper operation of the entire packaged system as specified herein.

B. The Fire Pump manufacturer shall have a quality management system in place and shall be ISO 9001 Certified.

1.5 SHOP DRAWINGS

A. Make complete shop drawings and working drawings of equipment furnished, including detailed drawings. Submittal data for the pumping system shall include, but is not limited to: pump curves, individual computer data sheets, system drawings, and complete description of control panel with wiring diagram, sequencing data, instrumentation, alarms, and a copy of certification of $1,000,000.00 minimum liability insurance.

B. Before the shop drawings are submitted for approval, submit drawings to the jurisdictions for approval. All approvals shall be noted on the drawings or by letter from the departments.

C. The Architect's approval of shop drawings shall not relieve the responsibility of correctly figured dimensions or any errors that may be contained in these drawings. The omission of any material shown on the contract drawings, or specified from the shop drawings, even though approved, shall not relieve the responsibility to furnish and erect them.

1.6 FACTORY TEST

A. All equipment will be factory tested in accordance with the requirements of NFPA, UL and FM. Additionally the entire packaged system will be hydrostatically tested by the system manufacturer prior to shipment.

PART 2 - PRODUCTS

2.1 DESIGN

A. Pump shall be designed to deliver 1500 gpm when operating against at TDH as shown below. The pump shall also deliver not less than 150% of rated capacity at a pressure not less than 65% of rated pressure. Minimum suction pressure is 30 psig. Motor and pump speed shall not exceed 1775 rpm. Unit provide under provision NFPA-20, 1993. Unit pressure shut-off head shall not exceed 140% of rated pressure.

DESIGN POINTS	GPM	TDH	% DESIGN TDH
SHUTOFF	0	275 HD	0%
DESIGN	1500	231 HD	100%
150% DESIGN FLOW	2250	155 HD	150%

2.2 PUMP

A. The pump shall be horizontal, split case, class 40, cast iron, bronze fitted, centrifugal fire pump listed by Underwriters Laboratories and/or approved by Factory Mutual (UL/FM).
1. The unit shall be a Patterson 8” suction x 6” discharge, Model 8X6MI
2. The unit shall be mounted on a fabricated steel base, complete with coupling, OSHA approved, coupling guard, and directly connected to the motor.
3. The pump shall be clockwise rotation as viewed from the driver end.
4. The pump discharge flange shall be rated for 125 lbs
5. The pump casting shall be smooth, free of scale, lumps, cracks, sand holes and defects of any nature which may make it unfit for the use for which it is intended.
6. The bolting of pressure-holding castings shall be such that the maximum stress on any bolt will not exceed ¼ the elastic limit of the material as computed by using the stress area and on the basis of the water pressure equivalent to the shutoff pressure effective over the area out of the center line of the bolts.
7. The pump bearings shall have an L-10 rating of not less than 5000 hours based on load ratings and fatigue life.
8. The shaft shall be sealed with a stuffing box and packing with external water-seal piping. The stuffing box glands shall exert uniform pressure on the packing.
9. Bearing housing supports, and suction and discharge flanges shall be integrally case with the lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges. Replaceable shaft sleeves shall be furnished and are to be of bronze ASTM-A148 material. The shaft sleeves shall be held in position by the impeller key and locked in position by a separate threaded sleeve nut.
10. Water slingers of corrosion-resistant material shall be provided to seal the bearings at their inner ends.
11. The pump casing shall be hydrostatical strength-tested to a minimum of 250 psi, or not less than twice the maximum shut-off pressure.

2.3 DRIVER

A. The motor shall be125 HP, 1775 rpm, 3 phase, 60 cycle, 480 volt, horizontal open Dripproof motor with a 1.15 service factor.

2.4 FIRE PUMP CONTROLLER WITH TRANSFER SWITCH

A. The controller shall be a Hubbell Model LX2100, UL/FM labeled combined manual and automatic type designed for soft start / soft stop.
1. NEMA Type 2 enclosure
2. The fire pump controller and transfer switch shall be a single factory wired unit meeting the requirements of the most recently mandated edition of NFPA 20 and shall be listed by Underwriter’s Laboratories and approved by Factory Mutual Research Corporation. Both shall bear the labels of UL, ULC, CSA, FM and NYB of S and A.

B. The minimum withstand rating of the controller shall not be less than 100,000 Amps RMS Symmetrical at 480 V.

C. The controller manufacturer shall provide a five year warranty to include all parts and replacement labor covering the controller power circuit components, including isolating switch, circuit breaker, current sensing module and motor contractors.

D. The isolating disconnect switch and circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism.

E. The controller shall have a minimum running period timer set for 10 minutes. Terminals shall be provided to field convert the controller from automatic to manual shutdown.

F. The Controller shall have externally mounted individual visible indicators for:
1. Power available
2. Low Pressure
3. Local start
4. Remote start
5. Deluge valve open
6. Phase failure
7. Phase reversal
8. Interlock on
9. Pump running
10. Run timer on

G. The controller shall be supplied with duplicate, individual Phase Failure, Phase Reversal and Pump Operating alarm contacts.

H. The power transfer switch shall be designed for use with generator set emergency power source. The power transfer switch shall include a motor rated disconnect / isolating switch capable of interrupting the motor locked rotor current. The disconnect / isolating switch shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism.

I. The transfer switch circuitry shall be capable of sensing both the normal power source and the emergency source. The normal power source pickup shall be set to pickup at 90% nominal voltage and 95% nominal frequency. All voltage sensing, frequency sensing, and time delays shall be field adjustable. The transfer signal shall be delayed for one second, delaying the transfer and engine start signals so as to override momentary normal power outages.

J. The transfer switch shall have the following mounted on the flange of the enclosure:
1. Transfer switch normal pilot light
2. Transfer switch emergency pilot light
3. Emergency Isolating switch off pilot light
4. Test switch
5. Transfer bypass switch
6. Audible Alarm pushbutton
7. Silence Alarm pushbutton

K. The transfer switch shall be electrically operated and mechanically held, and shall be capable of being operated by a manual transfer mechanism located on the switch.

2.5 PUMP ACCESSORIES

A. ½” automatic air release valve

B. 4-1/2” suction and discharge gauges

C. ¾” Casing Relief Valve

D. 6” x 8” Concentric Discharge Increaser (125 lb)

E. 8” outside hose valve header (125 lb)

F. Six 2-1/2” hose valves with caps and chains

2.6 JOCKEY PUMP

A. The jockey pump controller shall be a Patterson Model FPJP complete with fusible disconnect, Hand-Off-Automatic selector switch and a pressure switch. The controller shall be rated for 2 HP, 3 Phase, 60 Cycle, 460 Volt operation.

B. The minimum enclosure rating shall be NEMA Type 2, driptight.

PART 3 - EXECUTION

3.1 FACTORY FABRICATION

A. All of the above equipment will be mounted on an open structural steel I-beam skid. All piping, pressure sensing lines, pump by-pass, shut-off valves, stuffing box and casing relief valve drains will be firmly anchored to the steel base by means of structural steel supports. All electrical wiring between controllers and drivers will be completed and tested at the factory. The entire package will require one power connection by the electrical contractor.

3.2 INSTALLATION

A. Installation shall be in accordance with manufacturer’s instructions.

3.3 FIELD ACCEPTANCE AND START-UP SERVICE

A. The service of a factory-trained representative shall be made available on the job site to check installation, field acceptance testing, start-up and instruct operating personnel.

B. In order to ensure the fire pump unit is properly coordinated and will function in accordance with the intent of these specifications, all the equipment required to comprise the fire pump unit will be supplied by the fire pump manufacturer in whom shall be vested unit responsibility for the proper function of the complete fire pump unit including the fire pump, motor or engine, base plate, control equipment and other required accessories.

C. To verify compliance with this requirement, the fire pump manufacturer will be required to submit a notarized Certificate of Compliance certifying that all components of the fire pump unit were in fact supplied by the fire pump manufacturer and acknowledging its responsibility for the proper function of the unit.

3.4 GUARANTEE

A. The packaged fire pumping system shall be guaranteed in writing, by the manufacturer for a period of one year from date of shipment against defect in design, material or construction.

END OF SECTION

SECTION 21 31 14

FIRE PUMP CONTROLLER WITH TRANSFER SWITCH

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide and install fire pump controller with transfer switch, and accessories as outlined.

1.2 RELATED WORK

A. Division 26, Electrical

1.3 STANDARDS

A. Make the installation in accordance with applicable requirements of National Fire Protection Association (NFPA) pamphlets, Factory Mutual, and any requirements of state or local authorities.

B. Furnish equipment and materials approved by NFPA and UL.

PART 2 - PRODUCTS

2.1 FIRE PUMP CONTROLLER WITH TRANSFER SWITCH

A. The controller shall be a Hubbell Model LXi2100, UL/FM labeled combined manual and automatic type designed for soft start / soft stop, with transfer switch.
   1. NEMA Type 2 enclosure
   2. The fire pump controller and transfer switch shall be a single factory wired unit meeting the requirements of the most recently mandated edition of NFPA 20 and shall be listed by Underwriter's Laboratories and approved by Factory Mutual Research Corporation. Both shall bear the labels of UL, ULC, CSA, FM and NYB of S and A.

B. The minimum withstand rating of the controller shall not be less than 100,000 Amps RMS Symmetrical at 480 V. Provide surge protection device.

C. The controller manufacturer shall provide a five year warranty to include all parts and replacement labor covering the controller power circuit components, including isolating switch, circuit breaker, current sensing module and motor contractors.

D. The isolating disconnect switch and circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism.

E. The controller shall have a minimum running period timer set for 10 minutes. Terminals shall be provided to field convert the controller from automatic to manual shutdown.

F. The Controller shall have externally mounted individual visible indicators for:
   1. Power available
   2. Low Pressure
   3. Local start
   4. Remote start
   5. Deluge valve open
   6. Phase failure
   7. Phase reversal
   8. Interlock on
   9. Pump running
   10. Run timer on

G. The controller shall be supplied with duplicate, individual Phase Failure, Phase Reversal and Pump Operating alarm contacts.

H. The power transfer switch shall be designed for use with generator set emergency power source. The power transfer switch shall include a motor rated disconnect / isolating switch capable of interrupting the motor locked rotor current. The disconnect / isolating switch shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism.

I. The transfer switch circuitry shall be capable of sensing both the normal power source and the emergency source. The normal power source pickup shall be set to pickup at 90% nominal voltage and 95% nominal frequency. All voltage sensing, frequency sensing, and time delays shall be field adjustable. The transfer signal shall be delayed for one second, delaying the transfer and engine start signals so as to override momentary normal power outages.

J. The transfer switch shall have the following mounted on the flange of the enclosure:
1. Transfer switch normal pilot light
2. Transfer switch emergency pilot light
3. Emergency Isolating switch off pilot light
4. Test switch
5. Transfer bypass switch
6. Audible Alarm pushbutton
7. Silence Alarm pushbutton

K. The transfer switch shall be electrically operated and mechanically held, and shall be capable of being operated by a manual transfer mechanism located on the switch.

PART 3 – EXECUTION – NOT USED

END OF SECTION

SECTION 22 01 00

PLUMBING OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Compilation product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare operating and maintenance data as specified.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit three copies of complete manual in final form.

1.2 SUBMITTALS

A. Thirty (30) days after the Contractor has received the final scheduled identified submittals bearing the Architect/Engineer's stamp of acceptance (including resubmittals), submit for review one copy of the first draft of the Operating and Maintenance Manual. This copy shall contain as a minimum:
1. Table of Contents for each element.
2. Contractor information.
3. All submittals, coordination drawings and product data, reviewed by the Architect / Engineer; bearing the Architect / Engineer's stamp of acceptance. (When submittals are returned from Engineer "Correct as Noted", corrected inserts shall be included.)
4. All parts and maintenance manuals for items of equipment.
5. Warranties (without starting dates)
6. Certifications that have been completed. Submit forms and outlines of certifications that have not been completed.
7. Operating and maintenance procedures.
8. Form of Owner's Training Program Syllabus (including times and dates).
9. Control operations/equipment wiring diagrams.
10. Other required operating and maintenance information that are complete.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit completed manuals in final electronic form to the Architect / Engineer one day after substantial completion, and prior to Owner's instructions. Include all specified data, test and balance reports, drawings, dated warranties, certificates, reports, along with other materials and information.

D. The Architect/Engineer will review the manuals for completeness within fifteen (15) days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Architect / Engineer. The manuals will not be retransmitted.

F. Complete electronic manuals will be delivered to the Owner.

PART 2 - PRODUCTS

2.1 BINDERS

A. Commercial quality black three-ring binders with clear overlay plastic covers.

B. Minimum ring size: 1 inch; Maximum ring size: 3 inches.

C. When multiple binders are used, correlate the data into related groupings.

D. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals:
1. Prepare data in form of an instructional manual for use by Owner's personnel.
2. Format:
a. Size: 8-1/2 inch x 11 inch.
b. Text: Manufacturer's printed data or neatly typewritten.
3. Drawings:
a. Provide reinforced punched binder tab and bind in text.
b. Fold larger drawings to size of text pages.
4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
a. Title of Project
b. Identity of separate structures as applicable.
c. Identity of general subject matter covered in the manual.
6. Binder as specified.

B. Content of Manual:
1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
a. Contractor, name of responsible principal, address and telephone number.
b. A list of each product required to be included, indexed to content of the volume.
c. List with each product, name, address and telephone number of:
1) Subcontractor or installer.
2) Maintenance contractor as appropriate.
3) Identify area of responsibility of each.
4) Local source of supply for parts and replacement.
d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
a. Include those sheets pertinent to the specific product.
b. Annotate each sheet to:
1) Identify specific product or part installed.
2) Identify data applicable to installation.
3) Delete references to inapplicable information. (All options not supplied with equipment shall be marked out indicated in some manner.
3. Drawings:
a. Supplement product data with drawings as necessary to illustrate:
1) Relations of component parts of equipment and systems.
2) Control and flow diagrams.
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
c. Do not use Project Record Documents as maintenance drawings.
4. Written text, as required to supplement product data for the particular installation:
a. Organize in consistent format under separate headings for different procedures.
b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued.
a. Provide information sheet for Owner's personnel, giving:
1) Proper procedures in event of failure.
2) Instances that might affect validity of warranties or bonds.
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems.
1. Content for each unit of equipment and system as appropriate:
a. Description of unit and component parts.
1) Function, normal operating characteristics, and limiting conditions.
2) Performance curves, engineering data and tests.
3) Complete nomenclature and commercial number of replaceable parts.
b. Operating procedures:
1) Start up, break-in, routine and normal operating instructions.
2) Regulation, control, stopping, shut down and emergency instructions.

3) Summer and winter operating instructions.
4) Special operating instructions.

c. Maintenance procedures:
1) Routine operations
2) Guide to trouble-shooting.
3) Disassembly, repair and reassembly.
4) Alignment, adjusting and checking.
5) Routine service based on operating hours.

d. Servicing and lubrication schedule. List of lubricants required.
e. Manufacturer's printed operating and maintenance instructions.
f. Description of sequence of operation by control manufacturer.
g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
1) Predicted life of part subject to wear.
2) Items recommended to be stocked as spare parts.
h. As installed control diagrams by controls manufacturer.
i. Complete equipment internal wiring diagrams.
j. Each Contractor's coordination drawings.
k. As installed color coded piping diagrams.
l. Charts of valve tag number, with location and function of each valve.
m. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
n. Other data as required under pertinent sections of the specifications.

2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications.
4. Provide complete information for products specified in Division 22.
5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.
8. Provide training report and certificates.
9. Provide backflow preventer certified test reports.
10. Provide gas piping pressure test reports.

END OF SECTION

SECTION 22 05 00

PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 22 Plumbing.

B. Applicable provisions of this section apply to all sections of Division 22, Plumbing.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Plumbing work shall comply with applicable inspection services:
1. Underwriters Laboratories
2. National Fire Protection Association
3. State Health Department
4. Local Municipal Building Inspection Department
5. Texas Department of Licensing & Regulations (TDLR)
6. Texas Accessibility Standards (TAS Based on ADA)

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A licensed specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system
2. Able to furnish evidence of having contracted for and installed not less than three systems of comparable size and type that has served their Owners satisfactorily for not less than three years.

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for

the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.

B. At the conclusion of project, obtain without cost to the Owner, erasable mylars of the original drawings and transfer as-built changes to these. Prior to transmittal of corrected drawings, obtain three sets of blue-line prints of each drawing, regardless of whether corrections were necessary and include in the transmittal (two sets are for the Owner's use and one set is for the Architect / Engineer's records). Delivery of these as-built prints and reproducibles is a condition of final acceptance. Provide record drawings on one set each (reproducible Dayrex mylar film positives) and AutoCad 2012 / Revit CAD files on disk (CD Rom).

C. As-Built drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
2. Remove Engineer’s seal, name, address and logo from drawings.
3. Mark documents RECORD DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY
5. Indicate all changes to construction during construction. Indicate actual routing of all piping, ductwork, etc. that were deviated from construction drawings.
6. Indicate exact location of all underground plumbing and flow line elevation.
7. Indicate exact location of all underground plumbing piping and elevation.
8. Indicate exact location of all underground electrical raceways and elevations.
9. Correct schedules to reflect (actual) equipment furnished and manufacturer.
10. During the execution of work, maintain a complete set of drawings and specifications upon which all locations of equipment, ductwork, piping, devices, and all deviations and changes from the construction documents in the work shall be recorded.
11. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and plumbing valves.
12. Exact location of all electrical equipment in and outside of the building.
13. Fire Protection System documents revised to indicate exact location of all sprinkler heads and zone valves.
14. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
15. Cloud all changes.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect / Engineer, the exact location of all items.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

1.10 GUARANTEE

A. Guarantee work for one year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 22 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

1.14 OPERATING TESTS

A. After all plumbing systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect / Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit three copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.15 WARRANTIES

A. Submit three copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.16 BUILDING CONSTRUCTION

A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each subcontractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 OPENINGS

A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.2 HOUSEKEEPING PADS

A. Provide equipment housekeeping pads under all floor mounted and ground mounted plumbing equipment, and as shown on the drawings.

B. Concrete work as specified in Division 3.

C. Concrete pads:
1. 4 inch high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings
2. Chamfer strips at edges and corner of forms.
3. Smooth steel trowel finish.
4. Doweled to existing slab

D. Install concrete curbs around multiple pipe penetrations.

3.3 VANDAL RESISTANT DEVICES

A. Provide a handle for each loose keyed operated valve and hose bibb on the project.

B. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner two suitable tools for use with each type of fastener used.

C. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.4 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the plumbing systems.
1. Provide the training during the Owner's regular working day.
2. The Instructors shall each be experienced in their phase of operation and maintenance of building plumbing systems and with the project.

B. Time to be allocated for instructions.
1. Minimum of 8 hours dedicated instructor time.
2. 4 hours on each of 2 days.

C. Before proceeding with the on-site training program, submit the program syllabus; proposed time and dates; and other pertinent information for review and approval.
1. One copy to the Owner.
2. One copy to the Architect / Engineer.

D. The Owner will provide a list of personnel to receive instructions, and will coordinate their attendance at the agreed upon times.

E. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of the training program that instructions have been satisfactorily completed. Give time and date of each demonstration and hours devoted to the demonstration, with a list of people present.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.5 EQUIPMENT IDENTIFICATION

A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
1. Designation approved by Architect / Engineer.
2. Equipment includes, but is not limited to, water heaters, pumps, boilers and utility controllers.
3. Submit schedule of equipment to be included and designations.

B. Provide nameplates with ½ inch high letters and fastened with epoxy or screws.

3.6 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.7 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

END OF SECTION

SECTION 22 05 10

PLUMBING CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples. All exposed finishes shall be approved by the Architect. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide qualified personnel to observe:
1. Field conditions.
2. Condition of installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Testing, adjusting, and balancing of equipment.

B. Representative shall make written report of observations and recommendations to Architect / Engineer.

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to the project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather will be rejected, and the Contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

B. Adequately protect equipment from damage after delivery to the project. Cover with heavy tarpaulins, drop cloths or other protective coverings as required to protect from plaster, paint, mortar and/or dirt. Do not cover with plastic materials and trap condensate and cause corrosion.

END OF SECTION

SECTION 22 05 12

PLUMBING SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 1.

B. The term submittal, as used herein, refers to all:
1. Shop Drawings
2. Coordination Drawings
3. Product data

C. Submittals shall be prepared and produced for:
1. Distribution as specified
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relationship to adjacent features, critical features, work, or products.

D. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: ¼ inch = 1 foot - 0 inch.

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each mechanical room and for each outside equipment pad where equipment is located, submit plan and elevation drawings. Show:
1. Actual mechanical equipment and components to be furnished
2. Service clearance
3. Relationship to other equipment and components
4. Roof drains and leader piping
5. Fire protection piping and equipment

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Related requirements:
1. Ductwork shop drawings
2. Coordination drawing specified in Division 26

F. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

G. Gas piping sketch indicating proposed location of piping prior to proceeding with the installation.

1.4 PRODUCT DATA AND INSTALLATION INSTRUCTION

A. Submit only pages which are pertinent to the project. All options which are indicated on the product data shall become part of the contract and shall be required whether specified are not.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: “Comply, ”Do Not Comply”, or “Not Applicable”. Explain all “Do Not Comply” statements.

F. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Manufacturer's catalog numbers
4. Conformance with requirements of Contract Documents

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect/Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect/Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect/Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect/Engineer reviews submittals or not, unless Architect/engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
1. Proper sizes and capacities
2. That the item will fit in the available space in a manner that will allow proper service
3. Construction methods, materials and finishes

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
   1. Shop Drawings and Coordination Drawings: Submit one reproducible transparency and three opaque reproductions.
   2. Product Data: Submit the number of copies which the contractor requires, plus those which will be retained by the Architect/Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name and address
   4. The number of each Shop Drawing, Project Datum and Sample submitted
   5. Other pertinent data

D. Submittals shall include:
   1. The date of submission
   2. The project title and number
   3. Contract Identification
   4. The names of:
      a. Contractor
      b. Subcontractor
      c. Supplier
      d. Manufacturer
   5. Identification of the product
   6. Field dimensions, clearly identified as such
   7. Relation to adjacent or critical features of the work or materials
   8. Applicable standards, such as ASTM or federal specifications numbers
   9. Identification of deviations from contract documents
   10. Suitable blank space for General Contractor and Architect/Engineer stamps
   11. Contractor's signed and dated Stamp of Approval

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
   1. Finishes which involve Architect/Engineer selection of colors, textures or patterns
   2. Associated items which require correlation for efficient function or for installation

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number
   2. The exact specification section title

B. Submittals delivered to the Architect/Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make re-submittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a re-submittal
   2. Identify changes made since previous submittals

B. Indicate any changes which have been made, other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect/Engineer that Contractor has either determined and verified all quantities, dimensions, field

construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect/Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect/Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT/ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect/Engineer will:
1. Review identified submittals with reasonable promptness and in accordance with schedule
2. Affix stamp and initials or signature, and indicate requirements for re-submittal or approval of submittal
3. Return submittals to Contractor for distribution or for resubmission

B. Review and approval of submittals will not extend to design data reflected in submittals which is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect/Engineer's review and approval is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Div. 1.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 22 05 13

ELECTRICAL PROVISIONS OF PLUMBING WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical provisions to be provided as plumbing work are indicated in other Division 22 sections, on drawings, and as specified.

B. Types of work, normally recognized as electrical but provided as plumbing, specified or partially specified in this Section, include but are not necessarily limited to the following:
1. Motors for plumbing equipment.
2. Starters for motors of plumbing equipment, but only where specifically indicated to be furnished integrally with equipment.
3. Wiring from motors to disconnect switches or junction boxes for motors of plumbing equipment, but only where specifically indicated to be furnished integrally with equipment.
4. Wiring of field-mounted float control switches, flow control switches, and similar plumbing-electrical devices provided for plumbing systems, to equipment control panels.
5. Pipe heat tracing.

C. Refer to Division 22 sections for specific individual plumbing equipment electrical requirements.

F. Refer to Division 26 sections for motor starters and controls not furnished integrally with plumbing equipment.

G. Refer to Division 26 sections for junction boxes and disconnect switches required for motors and other electrical units of plumbing equipment.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to work of this Section.

1.3 QUALITY ASSURANCE

A. Wherever possible, match elements of electrical provisions of plumbing work with similar elements of electrical work specified in Division 26 sections for electrical work not otherwise specified.

B. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.4 SUBMITTALS

A. Include in listing of motors, voltage, notation of whether motor starter is furnished or installed integrally with motor or equipment containing motors.

PART 2 - PRODUCTS

2.1 MOTORS

A. Provide motors for plumbing equipment manufactured by one of the following:
1. Baldor Electric Company.
2. Century Electric Div., Inc.
3. General Electric Co.
4. Louis Allis Div.; Litton Industrial Products, Inc.
5. Lincoln Electric
6. Marathon Electric Mfg. Corp.
7. Reliance Electric Co.
8. Westinghouse Electric Corp.

B. Motor Characteristics. Except where more stringent requirements are indicated, and except where required items of plumbing equipment cannot be obtained with fully complying motors, comply with the following requirements for motors of plumbing work:

C. Temperature Rating. Rated for 40 deg. C environment with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).

D. Provide each motor capable of making starts as frequently as indicated by automatic control system, and not less than 5 starts per hour for manually controlled motors.

E. Phases and Current Characteristics. Provide squirrel-cage induction polyphase motors for ¾ hp and larger, and provide capacitor-start single-phase motors for ½ hp and smaller, except 1/6 hp and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division 26 sections, and with individual equipment requirements specified in other Division 22 requirements. For 2-speed motors provide two separate windings on polyphase motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.

F. Service Factor. 1.15 for polyphase motors and 1.35 for single-phase motors.

G. Motor Construction. Provide general purpose, continuous duty motors, Design "B" except "C" where required for high starting torque.
1. Frames. NEMA #56.
2. Bearings are to be ball or roller bearings with inner and outer shaft seals, regreasable except permanently sealed where motor is inaccessible for regular maintenance. Where belt drives and other drives produce lateral or axial thrust in motor, provide bearings designed to resist thrust loading. Refer to individual section of Division 22 for fractional-hp light-duty motors where sleeve-type bearings are permitted.
3. Except as indicated, provide open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and provide guarded drip-proof motors where exposed to contact by employees or building occupants. Provide weather-protected Type I for outdoor use, Type II where not housed. Refer to individual sections of Division 22 for other enclosure requirements.
4. Provide built-in thermal overload protection and, where indicated, provide internal sensing device suitable for signaling and stopping motor at starter.
5. Noise Rating: Provide "Quiet" rating on motors.

H. All motors shall be premium efficiency.

2.2 EQUIPMENT FABRICATION

A. Fabricate plumbing equipment for secure mounting of motors and other electrical items included in work. Provide either permanent alignment of motors with equipment, or adjustable mountings as applicable for belt drives, gear drives, special couplings and similar indirect coupling of equipment. Provide safe, secure, durable, and removable guards for motor drives. Arrange for lubrication and similar running-maintenance without removal of guards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motors on motor mounting systems in accordance with motor manufacturer’s instructions, anchored to resist torque, drive thrusts, and other external forces inherent in plumbing work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Verify voltage with Electrical Plans.

END OF SECTION

SECTION 22 05 14

PLUMBING ALTERATIONS PROJECT PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Inspect and service existing equipment and materials that are to remain or to be reused.

B. Disposal of equipment, materials, or housekeeping pads to be abandoned. Prior to disposal, the Contractor shall verify with the Owner what is to be salvaged by the Owner and what is to become the property of the Contractor.

C. Handling of equipment and materials to be removed.

1.2 QUALITY ASSURANCE

A. Coordination with the Owner prior to the disconnection or shutdown of existing equipment, or to the modification of existing operational systems.

1.3 CONTRACT DRAWINGS

A. There is the possibility that existing conditions and devices are affected by the work indicated on the drawings and called for in the specifications (project manual) that do not appear on the drawings. It is the Contractor’s responsibility to visit the site and determine all of the existing conditions and to consider these existing conditions when making and presenting a proposal, to have a complete proposal.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Material used to upgrade and repair existing equipment shall conform to that specified.

B. Material used to upgrade and repair existing equipment shall not void existing warranties or listings of the equipment to be upgraded or repaired.

C. Material used to upgrade and repair existing equipment shall be new and shall be of the same manufacturer of the existing equipment, shall be acquired through the existing original equipment manufacturer’s approved distribution channels, shall have manufacturer’s warranties for the new material being used, and shall be listed for the use intended.

PART 3 - EXECUTION

3.1 INSPECTION

A. Existing materials and equipment indicated on the drawings or in the specifications to be reused shall be inspected for damaged or missing parts. Contractor shall notify the Architect/Engineer, in writing, accordingly.

B. If using materials specified or shown on the drawing voids or diminishes the warranty or operation of remaining equipment or systems, the Contractor shall notify the Architect/Engineer, in writing.

C. Verify field measurements, above and underground piping connections and flows.

D. Demolition Drawings are based on casual field observation, and when available, existing record documents. Report discrepancies to Architect before disturbing existing installation, and immediately after such discrepancies are discovered.

E. Field verify existing conditions and actual utility uses prior to final connections. Existing drawings may not have been available for all required information. Use pipe inspection camera system to

field verify existing sanitary / grease waste connections. Verify flow direction and depth prior to connection to existing plumbing systems.

3.2 APPLICATION

A. Existing materials and equipment indicated on the drawings or in the specifications to be reused shall be cleaned and reconditioned, including cleaning of piping systems prior to installation and reuse.

B. Material and equipment removed that is not to be salvaged for Owner's use or for reuse on the project shall become the property of the Contractor and be removed from the site.

C. Material or equipment salvaged for Owner's use shall be carefully handled and stored where directed by the Owner or the Architect / Engineer. Relocate material and / or equipment as directed by Owner.

D. Materials and equipment not indicated to be removed or abandoned shall be reconnected to the new system.

E. Materials, equipment and housekeeping pads not to be reused or reconnected shall be removed for Owner’s review and salvaged by Contractor.

F. Prior to start of construction, Contractor shall walk areas to be renovated with Owner to identify and document items to be salvaged for Owner’s use.

G. Clean and repair existing materials and equipment that remain or are to be reused.

H. Contractor shall utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

3.3 SEQUENCE AND SCHEDULE

A. Coordinate utility service outages with Utility Company, Architect and Owner.

B. Provide additional or temporary valves, piping and connections to maintain existing systems in service during construction.

C. Existing Plumbing Service: Refer to drawings for work in remodeled areas. Where facilities in these areas are to remain in service, any related work to keep the facilities in operation is specified in this Division. Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. Maintain acceptable temperature and humidity control within existing building during renovation activities.

D. Remove and replace existing Plumbing systems and appurtenances as occasioned by new or remodeled construction. Re-establish service that may be interrupted by remodeled construction.

E. Refer to other drawings series for work in remodeled areas. Where facilities in these areas are required to remain in service, any related work required to keep these facilities in operation is specified in this Division.

F. Remove and replace existing piping coincident with the construction.

G. Remove or relocate existing piping or housekeeping pads as occasioned by new or remodeled construction. Cap unused domestic piping beyond the new finish line.

H. Relocate all domestic piping as required to accommodate new work requiring precedence.

I. Remove concrete housekeeping pad where materials or equipment have been removed.

J. Remove all known utilities that do not provide service to the buildings that remain.

K. Remove existing plumbing vent penetrations through roof not to be reused.

3.4 DEMOLITION AND EXTENSION OF EXISTING PLUMBING WORK

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner's representative unless they are not wanted, then it will be the responsibility of this Contractor to remove such items and properly dispose of them. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon approval of the Owner's representative substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean, repair, and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore them to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner's representative to such items and receive further instructions before removal. Items damaged in repositioning operations are the contractor's responsibility and shall be repaired or replaced by the contractor as approved by the owner's representative, at no additional cost to the Owner.

D. Plumbing, piping and appurtenances to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner's representative. Piping not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Construction Inspector. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities that must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner's representative hereinbefore specified.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to mechanical installations that remain active. Modify installation or provide access panel as appropriate.

G. Extend existing installations using materials and methods compatible with existing plumbing installations, or as specified.

H. Existing plumbing piping and devices found to need additional hangers installed should be added at no additional cost to the Owner.

3.5 PROTECTION OF THE WORK

A. Provide adequate temporary support and auxiliary structure as necessary to ensure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of work from damage.

C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

3.6 IDENTIFICATION OF EQUIPMENT IN RENOVATED AREAS

A. Identification of Equipment: Provide new identification of all existing equipment to be reused and located within the renovated areas. Do not include the description “existing”. Provide new nameplates for all existing plumbing equipment in renovated areas as specified in Section 22 05 00 Plumbing General Provisions.

END OF SECTION

SECTION 22 05 15

PLUMBING EARTHWORK

PART 1 - GENERAL

A. Excavate and backfill for pipe trenches for underground piping, and excavate for structures installed as part of plumbing work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate trenches for underground piping to the required depth to ensure 2 foot minimum coverage over piping.

B. Cut the bottom of the trench or excavation to uniform grade.

C. Should rock be encountered, excavate 6 inches below grade, fill with bedding material and tamp well.

D. Lay out alignment of pipe trenches to avoid obstructions. Assure that proposed route of pipe will not interfere with building foundation before any cutting is begun. Should interference be found, contact the Architect/Engineer before proceeding.

3.2 BACKFILL

A. Backfill shall not be placed until the work has been inspected, tested and approved. Complete backfill to the surface of natural ground or to the lines and grades shown on drawings. Except where special materials are requested, use suitable friable soils from other excavation as backfill material. Do not use peat, silt, muck, debris or other organic materials. Deposit backfill in uniform layers and compact each layer as specified in Division 2.

B. Compacting Backfill. Place material in uniform layers of prescribed maximum thickness and wet or dry the material to optimum moisture content. Compact with power-driven tampers to the prescribed density. Place regular backfill in 8 inch maximum layers, loose measure. Compact to not less than 95 percent of maximum soil density as determined by ASTM D-698 Standard Proctor.

C. Restoration. Compact backfill, where trenching or excavation is required in improved areas such as pavements, walks, and similar areas, to a condition equal to the adjacent undisturbed earth, and restore surface of the area to the condition existing prior to trenching or excavating operation.

D. Provide 6 inch stabilized sand bed with 4 inch stabilized sand cover around each pipe.

3.3 DISPOSAL OF EXCESS MATERIAL

A. Remove excess excavation material or material unsuitable for backfill. Excess material can be spread on grade, or shall be removed from site as directed by the Owner/Architect.

END OF SECTION

SECTION 22 05 16

EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES OUTSIDE BUILDING SLAB

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 apply to this section.

B. Refer to Instructions to Bidders for substitution of materials and products.

C. Addenda issued during the bidding period that affect this section of the specifications.

1.2 WORK INCLUDED

A. Coordinating all excavating and backfilling for the underground storm sewer, sanitary sewer, water distribution lines, and all related appurtenances.

B. The extent of lines, excavation, and backfill shall be in conformance with the locations, lines, elevations and grades shown on the drawings prepared by the MEP Engineer.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Earthwork

B. Water Distribution

C. Sanitary Sewer

D. Plumbing

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM) Use current edition.
   1. ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
   2. ASTM D1556, Standard Test method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
   3. ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
   4. ASTM D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

B. City Standards

C. Local Governing Agencies

D. Texas Health and Safety Code, Chapter 161, Subchapter Q, as amended by House Bill No. 1927.

1.5 WARRANTY

A. Provide written warranty against defects in the material and workmanship for the work of this Section for a period of one year from the Date of Substantial Completion of the Project. Refer to Division 1 for Warranty form.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cement-Stabilized Sand: Clean, local sand mixed with not less than 1-1/2 sacks of Portland cement per ton; mix in a mill-type mixer.

B. Sand: Clean, local sand

C. Earth Backfill: Clean local material consistent with the surrounding earth material and free of large clods, roots, rocks or other debris.

PART 3 – EXECUTION

3.1 EXCAVATION

A. General:
1. All utility trenches shall be constructed in conformance with OSHA trench safety standards.
2. Sheeting and shoring shall be accomplished to the extent necessary to maintain the sides of the trench in a vertical position throughout the construction period for trenches five feet in depth or deeper. Where approved, trench sides may be laid back in lieu of shoring to meet OSHA safety standards.
3. Utilities shall not be constructed or laid in a trench in the presence of water. All water shall be sufficiently removed from the trench prior to the line placing operation to ensure a dry, firm bed on which to place the utility line.

B. Storm and Sanitary Sewer Trenches:
1. For pipe sizes less than 42 inches in diameter, the minimum trench width shall be outside diameter of pipe plus 18 inches.
2. Trenches shall be excavated to a depth of at least 6 inches below the barrel of pipe.

C. Appurtenances:
1. Any overdepth excavation below appurtenances shall be refilled with cement-stabilized sand.

D. Water Line Trenches:
1. Water lines shall be at least two feet in depth from the top of proposed grade to the top of pipe.
2. Trench width for water lines shall be a minimum of the outside pipe diameter plus 18 inches.
3. Trenches shall be excavated to a depth of at least 6 inches below the barrel of pipe.

3.2 PIPE BEDDING AND BACKFILL

A. Storm and Sanitary Sewer Trenches:
1. The cement-stabilized sand bedding shall not extend from a point 6 inches below the bottom of the pipe to the level of the spring line. This material shall not be used after it loses its moisture content.
2. The cement-stabilized sand shall be thoroughly rodded after being placed in the trench.
3. Bedding, sewer pipe, and initial backfill over the pipe must be placed in a single day for any given portion of pipe. Initial backfill shall be placed to one foot above the top of pipe for earth backfill and 6 inches over the top of pipe for cement-stabilized sand backfill.
4. Remainder of trench backfill shall be placed the next day or later in 8 inch lifts.
5. Backfill shall be placed in uniform layers not to exceed 8 inches loose depth, and compacted to a minimum of 95 percent of Standard Maximum Density (ASTM D698).
6. Backfill, under pavement and to one foot from outer edge, shall b e cement-stabilized sand, up to one foot below subgrade elevation. Remainder of backfill to subgrade to be as specified in paragraph 5 above and stabilized where required.

B. Water Line Trenches:
1. Pipe bedding shall consist of 6 inches of clean sand placed before the pipe is laid.
2. After laying pipe and ensuring that the pipe is properly placed and supported by the sand bedding, clean sand backfill shall be placed to 6 inches above the top of pipe. The sand backfill shall be thoroughly rodded and tamped for compaction.

3. For water lines to be beneath the building and pavement and to one foot from the outer edge of pavement, the remainder of the trench backfill shall be clean sand placed in 6 inch lifts and compacted to 95 percent Standard Proctor.
4. For water lines not beneath the building and pavement or within one foot from the outer edge of pavement the remainder of the trench backfill shall be earth fill placed in uniform layers not to exceed 8 inch loose depth. Each lift shall be compacted to a minimum of 90 percent of Standard Density (ASTM D698) at the proper moisture content specified in the soils report for this project. All earth backfill shall be placed the next day or later after the pipe is laid.

C. Natural Gas Trenches:
1. Natural gas lines shall not be installed under slabs on grade unless pipes are sleeved and vented as per Section 22 63 11.
2. Natural gas lines shall not be installed in trenches with other utilities.

D. Utility Locators:
1. Provide metallic locator over all underground utilities, including irrigation piping, plumbing, control wiring, conduit, data, etc. Locator tape shall be a maximum of 12 inches below grade and centered over the utility(s).

END OF SECTION

SECTION 22 05 17

PLUMBING ACCESS DOORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install access doors in wall or ceiling locations as required or shown for access to valves, controls, regulating devices, water arresters and other equipment requiring maintenance, adjustment or operation.

PART 2 - PRODUCTS

2.1 NON-FIRE RATED ACCESS DOORS

A. 16-Gauge frames

B. 14-gauge steel panels

C. Continuous fully concealed hinges

D. Flush screwdriver cam lock & cylinder lock for Owner selection

E. Prime coat finish

F. Brushed satin stainless steel finish for restroom, kitchen or cafeteria installation

G. Material suitable for wall and/or ceiling mounting

2.2 FIRE RATED ACCESS DOORS

A. UL listed, 1-1/2 hour Label “B”, access doors

B. 16-Gauge stainless steel

C. 20-Gauge insulated sandwich-type door panel.

D. Two inch thick with fire rated insulation

E. Continuous fully concealed hinge

F. Automatic closing and latching mechanism

G. Knurled knob and recessed key operation for Owner selection

H. Interior latch release slide for opening from inside

I. Prime coat finish

J. Material suitable for wall and/or ceiling mounting

2.3 ACCEPTABLE MANUFACTURERS

A. Milcor

B. MIFAB

C. Acudor

D. Elmdor

PART 3 - EXECUTION

3.1 INSTALLATION

A. Access doors specified in Division 22 will be installed by other crafts. Not all required access doors are shown. Coordinate with the Contractor to locate access doors for ease of operation and maintenance of concealed equipment.

B. Installation shall be in accordance with the manufacturer's printed instructions.

C. Minimum size required:
1. 24 inch x 24 inch for plumbing multiple isolation valves and electrical related items in ceilings
2. 8 inch x 8 inch for plumbing for single isolation valve or shock arrestor

END OF SECTION

SECTION 22 05 19

PRESSURE AND TEMPERATURE INSTRUMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies gauges, thermometers, wells and/or pressure and temperature test stations to be installed as specified.

1.2 RELATED WORK

A. Division 22, Plumbing
1. Plumbing General Provisions
2. Pipe and Pipe Fittings, General
3. Valves, Strainers and Vents

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - GAUGES AND THERMOMETERS

A. Trerice

B. Taylor

C. Marsh

D. Weksler

E. Marshalltown

F. Weiss

G. Miljoco

2.2 PRESSURE GAUGES

A. Case and Ring: 4 inch type 304 stainless steel; liquid filled case with stainless steel bayonet ring.

B. Dial: White aluminum with black markings

C. Window: Clear acrylic

D. Tube: Phosphor bronze and forged brass socket.

E. Gauge accuracy: +/- 1 percent over operating range.

F. For pulsating service, provide impulse dampers.

G. Without flange for pipe mounting.

H. With flange for wall mounting.

I. Weiss Model: Domestic Water 4CTS LF (Lead Free) 0-100 PSI

2.3 THERMOMETER WELLS

A. Brass or type 300 stainless steel. Machined bar stock, 1-piece construction (Lead Free).

B. Where installed in insulated piping or vessels, provide with extension neck to match insulation thickness.

C. Provide metal-to-metal contact with bulb chamber for maximum sensitivity.

D. Wells shall be sized to extend a minimum of 50 percent into pipe.

2.4 THERMOMETERS IN PIPING SYSTEMS OR VESSELS

A. Die cast aluminum case with baked epoxy finish.

B. Adjustable angle 9 inch scale length.

C. Clear acrylic window.

D. Brass stem, length to match well.

E. Red reading organic spirit filled-in magnifying glass column.

F. White background with black figures and markings.

G. Brass stems and union connections (Lead Free).

H Accuracy: +/- 1 percent of scale range.

I. Range:
1. Hot water lines: 30 deg. F to 240 deg. F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with drawing details and manufacturer's recommendations.

B. Provide a ball valve at each gauge (Lead Free).

C. Locate gauges and thermometers to be easily readable from the floor at a 5 foot-6 inch eye level. Use adjustable angle or rigid stem as required. Install gauges in upright position.

D. Install gauges in the following locations: across pumps, storage tanks, heat exchangers.

E. Install thermometer in the following locations: At storage tanks, across heat exchangers, across boiler, leaving side of water heater, leaving water side of tempered water valves, and hot water supply and return lines.
1. Hot water lines: 30 deg. F to 240 deg. F.
2. Tempered water valves 0 deg. F to 120 deg. F.

END OF SECTION

SECTION 22 05 23

VALVES, STRAINERS AND VENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plumbing Valves

B. Pipe strainer and suction diffusers.

PART 2 - PRODUCTS

2.1 VALVES

A. Pressure Ratings:
1. Unless otherwise indicated, use valves suitable for 125 minimum psig working steam pressure (WSP) and 450 deg. F.
2. The pressure temperature rating of valves shall be not less than the design criteria applicable to components of the system.

B. Butterfly Valves
1. Butterfly valves shall conform to MSS-SP67.
2. Liners, inserts and discs shall be suitable for the intended service.
3. Valves shall have a full lug type body designed for installation between ANSI standard flanges, and shall be rated at full working pressure with downstream flange removed.
4. All valves for domestic use must be lead free.

C. Ball Valves
1. Provide ball valves with:
a. Blowout proof stem.
b. Full size port, 316 stainless steel ball and stem.
c. Cast bronze body.
d. Threaded ends.
2. Seat, seals, thrust washers and packing shall be suitable for the intended service.
3. Service rating:
a. 150 psi saturated steam.
b. 600 psi WOG.
4. All valves for domestic use must be lead free.

D. Valve Connections
1. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves. Sweated joints are not allowed.
2. Thread pipe sizes 2 inches and smaller.
3. Flange pipe sizes 2-1/2 inches and larger.
4. Use screw to solder adapters for copper tubing.
5. Use grooved body valves with mechanical grooved jointed piping.
6. Use press valves when using copper press systems.

E. Valve Operators
1. Provide suitable hand-wheels for gate, globe, angle or drain valves and inside hose bibbs.
2. When cocks and valves are furnished with square head stem:
a. Provide one wrench for every ten cocks or valves sized 2 inches and smaller, minimum of two.
b. Provide each cock or valve size 2-1/2 inches and larger with a wrench with

setscrew.

3. Where butterfly valves are provided:
   a. Provide gear operators on valves 6 inches and larger.
   b. Where valves are located 7 feet or more above the finished floor in equipment room areas provide chain-operated sheaves. Extend chains to about 5 feet above floor and hook to clips, arrange to clear walking space.
   c. Lever lock handle with toothed plate for shut-off service and infinitely adjustable handle with lock and nut and memory stop for throttling service on valves 4 inches and smaller.

F. Acceptable Manufacturers (All listed must be lead free):
   1. Keystone
   2. Nibco

G. Check Valves
   1. Bronze body, 2 inches and smaller, bronze disc (Teflon disc for steam service), regrinding swing check, screw-in cap, threaded connection (Lead Free).
   2. Iron body, 2-1/2 inches and larger, bronze trim, non-slam: stainless steel pins and springs, and bronze plate or bronze mounted, regrind-renew check, bronze seat ring and disc. Provide either wafer or threaded lug (Lead Free).
   3. Acceptable Manufacturers (All listed must be lead free):
      a. Watts
      b. Nibco

H. Backflow Preventer (All valves for domestic use must be lead free):
   1. (2 inches and smaller) bronze body, reduced pressure zone type with two inline independent check valves with an intermediate relief valve, complete with two full port ball valve shut-offs and ball type test cocks. Bronze strainer on inlet. Provide air gap fitting with full size drain piped to nearest floor drain.
   2. (2-1/2 inches and larger) stainless steel or FDA epoxy coated ductile iron reduced pressure zone type with two inline independent check valves with reverse relief valves, two non-rising stem resilient sealed gate valves, cast iron strainer on inlet. Provide air gap fitting piped full size to nearest floor drain.

I. Provide valves of same manufacturer throughout where possible.

J. Provide valves with manufacturer's name and manufacturing location, duty and pressure rating clearly marked on outside of body.

K. Where valves are installed in insulated piping, provide with extended neck so valve operator and stop plate clears the full thickness insulation.

L. Provide valve, seat and trim materials suitable for the intended service.

M. Provide memory stops for all valves used for throttling service. Valves for throttling service shall be butterfly, plug, globe or ball type.

2.2 PIPE SYSTEMS STRAINERS

A. Body:
1. Bronze "Y" pattern or basket as shown on the drawings.
2. Line size.
3. Threaded strainer blow down port.
4. ASTM A #126 Class B Cast Iron Body.

B. Construction:
1. 2 inch size and smaller with screw connections rated 400 psi WOG.
2. Over 2 inch size with flanged connections, rated 125 psi WOG.

C. Fabricate screens of Monel or type 304 stainless steel:
1. With 20 mesh woven wire in piping systems through 2 inches.
2. With 0.045 perforations in piping systems 2-1/2 inches and 3 inches.
3. With 0.125 perforations in piping systems 4 inches and larger.

D. Start-up:
1. Provide an additional fine mesh disposable screen for use during start-up operations.
2. Remove after 30 days.
3. Attach to piping for Owner’s review.

E. Acceptable Manufacturers (All listed must be lead free):
1. Apollo
2. Crane
3. Keckley
4. Kitz
5. Mueller
6. McAlear
7. Muesco
8. Nibco
9. Zurn

2.3 SUCTION DIFFUSER

A. For each pump as shown on the drawing, provide an angle type suction diffuser. Body to fit both the pump inlet and suction pipe size.

B. Components:
1. Inlet straightening vanes.
2. Removable end cap.
3. Gauge ports.
4. Threaded strainer blow down port.
5. Adjustable support foot.
6. Removable magnetic insert.

C. The screen shall be as specified for pipe system strainers.

D. Provide an additional fine mesh disposable strainer for use during start up operations.
1. Remove after 30 days operation and all flushing is complete.
2. Attach to piping for owners review.

E. Construction:
1. 2 inch size and smaller with screw connections rated 400 psi WOG.

2. Over 2 inch size with flanged connections, rated 125 psi WOG.

F. Fabricate screens of Monel or type 304 stainless steel:
1. With 20 mesh woven wire in piping systems through 2 inches.
2. With 0.045 perforations in piping systems 2-1/2 inches and 3 inches.
3. With 0.125 perforations in piping systems 4 inches and larger.

2.4 VALVE SCHEDULE

A. Domestic Service
1. Gas shut-off service: UL approved for natural gas service.
a. Nibco Ball Valve, full port through 1 inch: T-585-70-UL
b. Nibco Ball Valve conventional port 1-1/4 inch through 3 inch: T-580-70- UL
c. Milwaukee Full Port ¼ inch-2 inch
d. Milwaukee Standard Port 2-1/2 inch & 3 inch
e. Kitz Full Port 2 inch =- #68
2. Cold and Hot water service (all listed must be Lead Free):
a. Nibco Ball Valve full port through 2 inch: T-585-66-LF
b. Nibco Ball Valve 2-1/2 inch and 3 inch conventional port: T-580-66-LF
c. Nibco Butterfly Valve 4 inch and larger: LD-2000 EDPM Gaskets
3. Check Valve (All listed must be Lead Free):
a. Nibco Check Valve: T - 413 - Y -LF (Teflon Seats)
b. Nibco Check Valve 2-1/2 inch and larger: F - 918 – Y -LF (Buna-N disc.)
c. Nibco Check Valve 2-1/2 inch and larger: W - 920 -W-LF (Wafer)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install valves for shut-off and isolating service at each piece of equipment, at vertical risers, and where shown on the drawings.

C. Use butterfly valves and ball valves in domestic hot water and domestic cold water systems interchangeable in place of gate and globe valves.

D. Use butterfly valves and ball valves in circulating water systems, for balancing duty.

E. Provide drain valves at main shut-off valves and low points of piping and apparatus so the systems can be entirely drained.
1. 1 inch valve for pipes 6 inch and larger.
2. 3/4 inch valve for pipes smaller than 6 inch.
3. Terminate with pipe plug.
4. Drain valves shall be ball valves.

F. Provide isolation valves in domestic water lines to isolate all equipment, restrooms, hose bibbs, and where shown on the drawings.

G. Where valves are installed in insulated pipe, valve operator shall have an insert so the lever or handle will not damage the insulation. Install handles so the lever or handles will not damage the insulation.

H. Provide clearance for installation of insulation and access to valves.

I. Provide access where valves are not exposed.

3.2 VALVE TAGS

A. Furnish valves with 1-1/2 inch diameter brass valve tags with stamped, black or red-filled numbers. Service designations shall be 1/4 inch letters, and valve numbers shall be 2 inch letters. Engineer shall approve Service designations. Secure tags to valves by use of brass "S" hooks or brass chain. Secure chain to valve by use of copper or Monel meter seals. Valve tags are not required if the valve is located within 3 feet of the equipment

being served and the service is obvious.

B. Mount charts and drawings listing functions of each valve and its location in a metal and glass frame. Place charts and drawings as directed; in addition, on the record drawings mark the symbols and furnish a valve schedule properly identifying the valve number, service, exact location, the material being piped, and the room number of area that the valve services. This schedule shall be furnished on reproducible drafting paper or film suitable for reproduction on an Ozalid machine. The Owner shall approve the size of drafting paper. Provide a copy of the valve chart in the Operating and Maintenance Manuals.

3.3 PIPE SYSTEMS STRAINERS

A. Provide strainers in supply piping to circulating pumps, thermostatic mixing valves, before solenoid valves and trap primer valves.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install piping insulation, jackets, accessories and covering of specified materials. The insulation shall be used for high and low temperature piping applications including domestic hot and cold water, roof and overflow drain sump bodies and rain leaders, horizontal sanitary drain piping which receives condensate, make-up water and pool heating water.

1.2 QUALITY ASSURANCE

A. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation that is absolutely satisfactory in both function and appearance. Provide insulation in accordance with the specifications for each type of service and apply as recommended by the manufacturer and as specified.

B. An approved contractor for this work under this Division shall be:
   1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
   2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their owners satisfactorily for not less than 3 years.

C. All piping insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50, as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.

D. Condensation on any insulated piping system is not acceptable.

E. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

F. Where existing insulated piping, or other surfaces are tapped, remove existing insulation back to undamaged sections for hot surfaces or to nearest insulation stop for cold surfaces, and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

1.3 APPROVALS

A. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 1 General Requirements and obtain approval before beginning installation. Include product description, list of materials and thickness for each service and location and the manufacturer's installation instructions for each product.

B. Make a field application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with installation of the work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Glass fiber pipe insulation:
   1. Johns-Manville Micro-Lok AP-T
   2. Owens-Corning ASJ/SSL
   3. Knauf ASJ/SSL

B. Cellular Glass Insulation (Foamglass):
   1. Pittsburg Corning
   2. Cell-U-Foam

C. Aluminum Jacketing:
   1. Childers
   2. Pabco
   3. RPR

D. Fiberglass reinforcing cloth mesh:
   1. Perma Glass Mesh
   2. Alpha Glass Mesh
   3. Childers Chil-Glas
   4. Vimasco

E. Mastics and Adhesives
   1. Childers
   2. Foster
   3. Vimasco
   4. Armstrong 520 Adhesive

F. Elastomeric Insulation
   1. Armacell

G. Weather Resistant Coating
   1. WB Armaflex Finish

H. Glass fiber blanket insulation
   1. Manville R-series Microlite FSKL
   2. Owens-Corning eD75 or ED100 RKF
   3. Knauf 0.75 PCF FSK

2.2 FIBERGLASS PIPE INSULATION

A. Heavy density, dual temperature fiberglass insulation with factory applied, all service, reinforced vapor barrier jacket having integral laminated vapor barrier. Provide with a factory applied pressure sensitive tape closure system and matching butt strips. Supply in thickness as shown.
   1. Thermal conductivity 0.23 @ 75°F mean (ASTM 335).

2.3 ELASTOMERIC INSULATION

A. Insulation material shall be flexible, closed-cell elastomeric insulation in tubular or sheet form. Material shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, latest revision. Sheet material with a thickness greater than ¾" shall have a flame spread rating of 25 or less and a smoke developed rating of 100 or less when tested in accordance with ASTM E84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, and the flame shall not be progressive. In addition, all materials shall pass simulated end-use fire test. Minimum ¾" thick.
   1. Thermal conductivity 0.27 at 75°F mean (ASTM C177 or C518)

2.4 CELLULAR GLASS INSULATION

A. ASTM C552:
   1. "k" value of 0.35 @ 75°F ("ksi" value of 0.047 @ 24°C);
   2. 8.0 lb./cu.ft. (128 kg/cu.m.) density

2.5 INSULATION/SHIELD AT HANGERS

A. Field fabricated: Use 360° sections of rigid foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized

metal covering at least half of the pipe circumference, and conforming to the schedule. Insulation shall extend at least 1" beyond metal shield on each end. When pipe is guided at top and bottom, metal shields shall cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide with respect to insulation with ½" aluminum bands (2) per shield.

1. Sections of foam glass insulation may be used of the same outside diameter of the adjoining pipe insulation.
2. Minimum thickness of foam glass insulation shall not be less than 1" thick.

B. Pipe saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter or more than 22". Provide 18 gauge through 4" pipe and 16-gauge 5" pipe and above.

2.6 SEALANT, ADHESIVE AND FINISH

A. Lap Adhesive. Provide Childers CP-82 adhesive.

B. Vapor Barrier Finish:
1. Indoors: Provide as insulation coating Childers CP-35, white.
2. Outdoors: Provide as insulation coating Childers Encacel X.
3. Underground: Provide Childers CP-22/24 for fittings and areas. Pittwrap cannot be used.

C. Sealant. Provide Childers CP-76 vapor barrier sealant.

D. Lagging Adhesive. Provide Childers CP-50.

E. Other products of equal quality will be acceptable only upon approval.

2.7 ALUMINUM JACKETING

A. Finish insulated piping outdoors with a smooth prefabricated Z-lock aluminum jacket 0.016" thick with factory applied 1 mil polyethylene/40 lb and Fab strap. Kraft moisture barrier. Childers Lock-On or approved equal.

B. Valves, Fittings and Flanges. For finishing valves, fittings, flanges and similar installations, provide formed aluminum covers, 0.024" thick.

C. Straps and Seals. Provide ½" x 0.020 stainless steel strapping and seals for jackets and covers according to manufacturer's recommendations.

2.8 GLASS FIBER BLANKET INSULATION

A. Minimum density of 1.0 PCF, 2" thick, installed R value to be 6.0 or better at 75°F mean, facing of 0.35 mil foil reinforced with glass yarn mesh and laminated to 40 lbs fire resistant kraft.

PART 3 - EXECUTION

3.1 INTERIOR PIPING

A. Cover all piping with glass fiber, heavy density, dual temperature pipe insulation with a vapor barrier jacket. Apply insulation to clean, dry pipes. Longitudinal seams shall be joined firmly together and sealed with self-sealing lap joints. Butt insulation joints firmly together and seal with a 3" wide ASJ butt strip seal. Longitudinal seams and butt strip laps shall be coated and sealed with CP-35 vapor barrier coating for chilled water piping applications.

B. Install hanger with protective shield, on the outside of all insulation.

C. Where domestic water pipes (1/2" & ¾" pipe sizes) are installed on trapeze type hangers, provide galvanized sheet metal protection shields at these locations. Place insulation jacket directly on hanger. Incompressible, load bearing insulation segments are not required.

D. Pipe Saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside

diameter. Provide 18-gauge through 4” pipe and 16-gauge for 5” pipe and above.

E. Seal ends of pipe for drinking chilled water insulation with vapor barrier mastic at valves, flanges, fittings and every 21' on straight runs of piping. Mastic should extend on top of ASJ jacket, across the glass, down onto the pipe making a complete seal.

F. Apply a smooth flood coat of white lagging Foster 8142W over all exposed insulation.

G. Piping to be insulated as specified above:
1. All hot and cold water.
2. Make-up water
3. Horizontal sanitary drain piping that receives condensate
4. Exposed to view storm drainage system including roof and overflow drain bodies, vertical piping from drain body and all horizontal rain leaders to first elbow turning down

3.2 PIPING OUTDOORS ABOVE GRADE

A. Insulate all water piping exterior of building above grade with rigid foam insulation and aluminum jacketing.

B. Adhere the vapor barrier jacket longitudinal seam with vapor barrier adhesive.

C. Cover all valves, fittings and flanges with factory made molded or field fabricated segments of pipe insulation of a thickness and material equal to the adjoining insulation. Adhere segments together with no voids, using CP-82 adhesive. Secure fitting insulation covers and segments in place with ½” wide glass filament tape.

D. Apply a tack coat of fitting mastic over the insulation and tape.

E. Neatly embed with 10 x 10 fiberglass cloth into the tack coat.

F. Apply mastic over the fiberglass cloth to a thickness where the fabric is not visible after completion.

G. Seal ends of pipe insulation with vapor barrier mastic at valves, flanges, fittings and every 21' on straight runs of piping. Mastic should extend on top of ASJ jacket, across the foam, down onto the pipe, making a complete seal.

H. Finish with aluminum jacketing as specified.

3.3 FLANGE, VALVE AND FITTING INSULATION

A. Cover valves and flanges with fabricated segments, fittings with two-piece factory molded fittings, and both of matching pipe insulation type and thickness equal to that of the adjoining pipe. Fittings and fabricated segments shall be securely held in place.
1. Apply a tack coat of insulating mastic to the insulated fitting to produce a smooth surface.
2. After mastic is dry, apply a second coat of vapor barrier mastic. Neatly embed with 10 x 10 fiberglass cloth into the tack coat.
3. Overlap mastic and fiberglass cloth by 2” on adjoining sections of pipe insulation.
4. Apply a second coat of mastic over the fiberglass cloth to present a smooth surface.
5. Apply mastic to a wet film thickness of 3/64”.
6. Fabric shall not be visible after completion.
7. Vapor seal flanges, valves and fittings with Childers CP-35.

B. PVC fitting covers are not acceptable.

3.4 ALUMINUM JACKETING (Insulated Piping Outdoors Above Grade)

A. Apply smooth aluminum jacket on piping, valves, fittings and flange covers according to manufacturer's recommendations, using stainless steel strapping and seals, to provide weather tight covering and to shed water.

B. Aluminum jacketing is not considered as contributing to the vapor barrier or the insulation jacket. The vapor barrier must be sufficient in itself for this function. Lap each adjoining jacket section a minimum of 3” to make a weather tight seal.

C. Install straps on 9” centers and at each circumferential lap joint.

D. Cover and seal all exposed surfaces.

E. The use of screws and rivets is not approved.

F. Provide isolation (30# felt) between the aluminum jacket and the sheetmetal protection shield at each pipe support point.

3.5 CONCEALED STORM DRAIN PIPING

A. Provide flexible glass fiber insulation with factory-applied, reinforced UL labeled Foil-Skrim-Kraft (FSK) facing. Install insulation of clean, dry piping.

B. Insulation shall be wrapped tightly on the piping with all circumferential joints and longitudinal joints overlapped a minimum of 2” with facing to the outside to obtain specified R-value using a maximum of 25% compression.

C. Provide vapor retarder at penetrations, joints, seams and damage to the facing with staples and FSK foil tape. The facing shall be taped with a minimum 3” wide strip of reinforced foil tape. Pressure-sensitive tape shall be a minimum 3” (76mm) wide and shall be applied with moving pressure using an appropriate sealing tool. Staples shall be outward cinch and placed 6” (152mm) on center.

D. Mechanical / Electrical rooms and above ceilings are considered concealed spaces.

3.6 MISCELLANEOUS

A. Install materials after piping has been tested and approved.

B. Apply insulation on clean, dry surfaces only.

C. Apply weather protective finish on elastomeric insulation installed in non-conditioned spaces. Provide a minimum of three coats.

3.7 INSULATION THICKNESS

INSULATED UNIT	THICKNESS (Inches)
Exposed Roof Drain Bodies and Horizontal Roof Drain Leaders	1
Exposed Roof Overflow Drain Bodies and Horizontal Drain Leaders	1
Domestic Cold Water/Make-Up Water Piping/Drinking Chilled Water	1
Horizontal Sanitary Drain Piping Which Receives Condensate	1
Domestic Hot Water Piping, 1-1/2” Pipe and Smaller	1
Domestic Hot Water Piping, 2” Pipe and Larger	1-1/2

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install domestic hot and cold water piping.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Valves, Strainers and Vents
2. Pipe and Pipe Fittings - General
3. Plumbing Piping Insulation
4. Plumbing Fixtures and Fixture Carriers

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Below Slab on Grade Piping for Water Entries:
1. 2-inch and smaller, provide ASTM B88 Type K (heavy wall) annealed tempered (soft) seamless copper water tube. No joints below slab entries.
2. 2-1/2-inch and 3-inch, provide ASTM B88 Type K (heavy wall) annealed tempered (soft) seamless copper water tube, 20 ft. straight lengths. One joint allowed below slab entry using wrought copper, solder-joint pressure fittings: ASME B16.22 with an approved brazing filler metal or pipe can be shop bent for no joint installation by using a “bending” temper tubing.
3. 4-inch and larger, provide ductile iron pipe with mechanical joints, ANSI A21.6.
4. 4 inch and larger, provide one-piece stainless steel IBR (in building riser), Watts or Ames.
5. 2 inch to 3 inch, provide one piece stainless steel IBR2 (in building riser). Watts or Ames.

B. Below Grade Piping Outside Building (beyond 5’-0” of building): Provide PVC water main pipe 4 inch through 12 inch in diameter in conformance with AWWA C900. When using 3” or smaller provide Schedule 40 PVC ASTM D1785 with ASTM D-2466 socket type fittings. Provide fittings in conformance with ASTM 2466. Furnish pipe with a minimum pressure rating of 150 lbs. per square inch. Provide PVC pipe as manufactured by Johns-Manville, CertainTeed, Clow or approved equal.

C. Below Slab on Grade Piping. Furnish ASTM B 88 and ANSI/NSF Standard 61 annealed tempered (soft), Type K copper water tube. Run continuous with no joints under the floor slab. Provide copper pipe corrosion protection as specified in this Section.

D. Above Slab Piping. Provide seamless ASTM B 88 and ANSI/NSF Standard 61 drawn tempered (hard) Type L copper water tube with wrought copper or bronze fittings with solder-joints, ANSI B16.22. Solder material shall be 95-5 (lead free) (Tin-Antimony-Grade 95TA) ASTM B 32.

E. Unions. Provide 150 lb. standard unions with ground joint and bronze seat. Flange joints larger than 2 inches. Provide dielectric isolating unions at junctions or connection between metallic piping of dissimilar metal. Provide pipe threads with standard taper pipe threads ANSI B2.1.

F. Alternate Method of Joining Copper Pipe and Tubing: Press Fittings: Copper press fitting shall conform to the material and sizing requirements of ASME B16.51. O-rings for copper press fittings shall be EPDM. VIEGA. The system intended for use shall be approved by submittal. Systems from various manufacturers may vary in technology. The field personnel shall carry training credentials from the approved manufacturer for the project. Mixing of fittings from different manufacturers is strictly prohibited.

2.2 WATER HAMMER ARRESTORS

A. Provide piston type hydraulic engineered/manufactured water hammer arrestors in cold and hot water

supply lines in chases or walls to each fixture branch or battery of fixtures serving quick closing valves of electrical, pneumatic, spring loaded type, or quick hand closure valves on fixture trim. Provide water hammer arrestors at the end of the branch line between the last two fixtures served. Provide Precision Plumbing Products, Inc., or equal. Size units according to water hammer arrestor's Standard PDI WH-201; refer to schedule on drawings.

B. Install all water hammer arrestors so as to attain 100% effectiveness according to Plumbing and Drainage Institute PDI-WH201 Table 5, 6 and 6-A for water hammer arrestors.

C. All water hammer arrestors shall be installed in a vertical position.

D. All water hammer arrestors shall be accessible and shall have access panels where required. Arrestors located above ceilings in fixture drops will not be acceptable. Refer to sizing and placement data as indicated in PDI Standard PDI-WH-201.

PART 3 - EXECUTION

3.1 DRAINAGE

A. Install water piping systems with uniform horizontal grade of 1/8 inch per 10 foot, minimum, to low points to provide complete system drainage. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to new level. Grade branches to drain to mains or risers. Unless otherwise indicated, terminate low points of risers with drain valve piped to nearest hub or floor drain.

3.2 STERILIZATION

A. Prior to starting work, verify system is complete, flushed and clean.

B. Inject chorine disinfectant in liquid, powder, tablet or gas form throughout the system to obtain 50 to 80 Mg/L residual.

C. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 20% of the outlets.

D. Retain disinfectant in system for 8 hours (minimum), 24 hours (maximum). During the disinfection process, operate all valves and accessories.

E. If final disinfectant residual tests less than 25 Mg/L, repeat treatment.

F. Flush disinfectant from system until chemical and bacteriological tests prove water quality equal to that of the service main.

G. Take samples no sooner than 24 hours after flushing from at least 10% of the outlets and from the water entry.
1. Obtain a minimum of one water sample flushing from at least 10% of the outlets and from the water entry.
2. Take samples from faucets located at highest point in the building, and farthest point from the main water supply.

H. If it is impossible to disinfect the potable water-storage tank as specified, the entire interior of the tank shall be swabbed with a solution containing 200 parts per million of available chorine. The solution shall remain for two hours before flushing and returning to service.

I. After final flushing, remove aerators, clean and replace.

J. Chemical and bacteriological tests shall be conducted by a state certified laboratory.

K. The firm performing the disinfection shall have chemical laboratory experience.

L. Provide a laboratory report to indicate the following information.

1. Name and address of the approved laboratory testing the samples.
2. Name and location of the project and date the samples were obtained.
3. Mg/L chlorine during retention.
4. Mg/L chlorine after flushing.
5. The coliform organism count. (An acceptable test shall show absence of coliform organisms.)

M. If analysis does not satisfy the specified minimum requirements, repeat the disinfection procedure.

N. Submit for approval to the Architect/Engineer a copy of the laboratory report and the certification of performance. An approved copy of each document shall be inserted in the Owner's manual.

3.3 UNDERGROUND WATER PIPING SYSTEM PROCEDURES

A. Lay sewer and water lines in separate trenches, separated by 10 foot of undisturbed or compacted soil.

3.4 TESTING

A. Test under a cold water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair leaks and retest system until proven watertight.

B. Test the domestic water piping system at 150psig hydrostatic pressure, maintained for 6 hours.

C. Use only potable water for the test.

D. Perform the test before fixtures, faucets, trim or final connections are made to equipment.

E. If the system is tested in sections, the entire domestic water piping system shall be submitted to a final test, employing the specified procedure.

F. Do not insulate or conceal piping systems until tests are satisfactorily complete.

G. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.

H. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

3.5 COPPER PIPE CORROSION PROTECTION

A. Corrosion protect copper tube piping systems:
1. In the building slab.
2. Beneath the building slab.
3. Buried.
4. Route plasti-sleeve 0.006 thick material entire length of below slab on grade copper tubing.

B. Cover copper tubing piping system with:
1. "Tapecoat" TC Primer.
2. "Tapecoat" CT cold applied coating tape.

C. Install coating system as specified by the manufacturer.

D. Extend the corrosion protection 2 inches above concrete slab on grade.

3.6 TEST OF PIPE CORROSION PROTECTION SYSTEM

A. Test the pipe corrosion protection coating with an approved high voltage tester adjusted to provide sufficient voltage to produce a spark through a pinhole in the coating (at least 15 kv AC).

B. Make repairs to small holes in accordance with the manufacturer's instructions.

C. Retest the repairs using procedures listed above.

D. Furnish certificate of compliance with field testing in Owner's manual.

END OF SECTION

SECTION 22 11 19

PIPING AND PIPING APPURTENANCES FOR COLD WATER MAKEUP

PART 1 - WORK INCLUDED

1.1 SCOPE

A. Furnish and install piping and piping appurtenances for cold water makeup piping.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Valves, Strainers and Vents
2. Plumbing Pipe and Pipe Fittings
3. Plumbing Piping Insulation

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Provide seamless, hard-drawn, Type L, copper water tube conforming to ASTM B88, and wrought copper fittings.

2.2 BACKFLOW PREVENTER

A. Watts Series 909 reduced pressure principal backflow preventer.

B. Factory assembled components as follows:
1. Isolating, shutoff, full port ball valves.
2. Incoming bronze strainer.
3. Test cocks.
4. Fixed air gap assembly.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

3.2 BACKFLOW PREVENTERS

A. Provide backflow preventers at the following locations.
1. HVAC Systems cold water make-up including chilled water, hot water and condenser water.
2. Pumping systems including water utility service and water softening equipment.
3. Where required by Code.

B. Installation according to manufacturer's recommendations.
1. Connect drain with fixed air gap assembly.
a. Pipe full size discharge from relief valve of RPZ to nearest floor drain or floor sink of proper size. Reference manufacturer’s suggested sizing of drains.
2. Provide pipe unions on inlet, outlet and discharge connection of the assembly for complete removal.
3. Provide isolation valve upstream of backflow assembly to allow complete removal of listed assembly.
4. Install backflow preventer assembly horizontally in an accessible location for testing and maintenance at a height not to exceed 60" above finished floor and no lower than 12" from finished floor to air gap outlet.

C. Provide certified testing of all backflow preventers.
1. Include certificates in O&M Manuals.

END OF SECTION

SECTION 22 11 23

DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General characteristics for pumps specified in Division 22 - Plumbing.

1.2 RELATED WORK

Requirements for pumps are specified in other sections of Division 22 - Plumbing, including the following:

A. Division 22 Plumbing - Electrical Provisions of Plumbing Work.

1.3 PUMP SELECTION

A. Select pumps conservatively for scheduled conditions. Furnish pumps that have reasonably high efficiencies, with peak efficiency at or near rated conditions. Select pumps that will operate stably at 15' suction lift despite substantial reduction in head or substantial increase in delivery.

B. If the pumps proposed are not considered suitable, submit manufacturer's data on other pumps, for review.

C. Scheduled design flow, design head, pump efficiency, and motor horsepower are the minimum acceptable.

D. The pump curve shall rise continuously from maximum flow to cut-off.

E. Shut-off head approximately 10 percent greater than design head, unless otherwise indicated in pump schedules.

F. Pump brake horsepower shall not exceed the motor horsepower rating over the entire operating range from shut-off to run-out.

G. Select the pump for operation at or near peak efficiency.

H. Cavitation-free at all points on the curve.

I. Impeller diameter shall not exceed 90 percent of the maximum published diameter.

1.4 PUMP SIZE AND TYPE

A. Provide motor-driven pumps of the type and speed scheduled. Select pumps that are not overloaded throughout the entire range of pump operation. Provide pump connection sizes as indicated.

B. Submit copies of manufacturer’s performance curves, as shop drawings on each pump. Clearly mark the curves for each pump to indicate the diameter of the impeller and the selection point.

1.5 CERTIFIED DATA

A. Submit factory certified pump curves showing pump performance characteristics with pump and system operating points plotted. Curves shall include as a minimum, flow (gallons per minute), head (feet of water), all available impeller diameters (inches), efficiency (percent), net positive suction head required (feet of water), brake horsepower, pump size and pump model. Show pump curves with system curve plotted.

PART 2 - PRODUCTS

2.1 DOMESTIC HOT WATER CIRCULATING PUMPS (Variable Speed) FRACTIONAL HORSEPOWER

A. Pump Construction:
1. Variable speed with automated ability to adjust and maintain optimum operating conditions Stainless steel housing
2. Check Valve
3. Flange or union connections
4. Built in timer
5. Built in temperature sensor
6. Build in differential pressure sensor
7. Programmable

B. Acceptable manufacturers:
1. Grundfos
2. Armstrong
3. Wilo

2.2 SUBMERSIBLE SUMP PUMPS AND SEWAGE EJECTORS

A. Pump Construction:
1. Hermetically sealed motor
2. Positive action air operated diaphragm switch
a. High water alarm contact
3. Housing and base cast iron construction

B. Provide an alarm terminal cabinet.
1. In the event of a high water alarm, energize a pulsing 2" diameter red signal light with graphic "sump pump high water alarm”.

C. Test the sump pump package by operation of the completed system through four cycles of operation.
1. Fill the sump to operational levels
2. Visually check level controls
3. Pump operation
4. Verify absence of piping leaks, sump leaks, excessive noise, and excessive vibration
5. Verify alarms
6. Verify pump capacity

D. Sump pump package capacity shall be as scheduled.

E. Acceptable Manufacturers:
1. Hydromatic
2. Little Giant Pump Co.
3. Weil
4. Goulds
5. Grundfos
6. Crane (Barnes) Air Pumps
7. Ebara
8. Zoeller Pumps

2.3 FLOW INDICATOR

A. Flow Indicator
1. Bronze Construction
2. Rotating wheel
3. Line Size
4. Double Window
5. Ernst Flow Industries Model EFI E-57-3

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the pumps in accordance with Manufacturer's "Installation, Start-up and Service Instructions".
   1. Provide access space around pumps for service.
   2. Lubricate pumps prior to start-up.
   3. Install hot water circulator horizontally, properly supported to wall, in an accessible location for testing and maintenance at a height not to exceed 60” above finished floor. Install line size Ernst bronze rotating wheel, flow indicator with double window, downstream of circulator.

B. Provide a line size isolation valve and strainer on the pump suction and a line size silent check valve and balancing valve on the pump discharge.

C. Support piping adjacent to the pump such that no weight is carried on the pump casing. Decrease from pipe size with eccentric reducer on suction side and concentric increaser on discharge side.

D. Ensure pumps:
   1. Operate at specified system fluid temperatures without vapor binding and cavitation.
   2. Are non-overloading in parallel and individual operation.
   3. Operate within 25 percent of midpoint of published maximum efficiency curve.

E. Refer to pump detail on the Contract Drawings for piping accessories to be provided.

3.2 ALIGNMENT FOR BASE MOUNTED PUMPS

A. Set the pump on a concrete inertia base or concrete housekeeping pad as specified. Anchor, level and grout.

B. Align the pump and driver in accordance with Hydraulic Institute Standards for centrifugal, rotary and reciprocating pumps.

C. Realign the pump and driver after initial leveling of pump base before placing the grout and again after the grout has set and the foundation bolts are tightened. Recheck the alignment after the piping has been connected.

3.3 MANUFACTURER START-UP SERVICE ALIGNMENT

A. After installation, the pumps and motors are to be aligned by the manufacturer or their representative utilizing a dial indicator. After completion, a formal report must be submitted by the Manufacturer to the Engineer prior to final acceptance. This report must include pump serial number, location, beginning and final alignment at a minimum.
   1. Technicians, as required, shall be trained and experienced in the work they perform (Contractor start-up / alignment is unacceptable).

B. Before starting pumps, but after connecting piping:
   1. Align shafts and coupling with a precision dial indicator alignment instrument to the minimum tolerances .004 (TIR) per inch of coupling radius or as recommended by the manufacturer, whichever is the greater.
   2. Tabulate the actual pump alignment reading with manufacturer's minimum tolerances.
   3. Submit readings for approval.
   4. Include the approved readings in the Owner's Maintenance Manual.

3.4 FINAL PUMP FLOW CALIBRATION

A. Based on the results of the final phases of the test and balance sequences, if the flow of the unthrottled pump is more than 10% above the scheduled values:
   1. Request detailed instructions from the pump manufacturer for the correct impeller diameter.
   2. Trim the impeller to the diameter recommended by the manufacturer, employing precision machinery.

B. Enter the information on the final configuration of the pump in the Owner's Manual.
   1. Modify the pump nameplate to reflect the correct head and flow data and the impeller diameter.

3.5 SPARE PARTS

A. Provide the following spare parts and material to the Owner for his use after the warranty period.
   1. A mechanical seal for each pump
   2. A set of bearings for each pump

END OF SECTION

SECTION 22 11 25

DOMESTIC WATER BOOSTER PUMP
(In-Line Vertical Multi-Stage w/VFD)

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Variable Speed Packaged Pumping System with VFDs.

1.2 REFERENCE STANDARDS

A. The work in this section is subject to the requirements of applicable portions of the following standards:
1. ANSI – American National Standards institute
2. ASTM – American Society for Testing and Materials
3. IEEE – Institute of Electrical and Electronics Engineers
4. NEMA – National Electrical Manufacturers Association
5. NEC – National Electrical Code
6. ISO – International Standards Organization
7. UL – Underwriters Laboratories

1.3 SUBMITTALS

A. Submit shop drawing and product as specified.

B. Submit manufacturer's certified capacity data.

C. Submit manufacturer's installation, start-up and service instructions.
1. Electrical Interlocks

D. Submit wiring diagram.

1.4 SHIPPING, HANDLING AND STORAGE

A. Deliver, store, protect, and handle in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals. All equipment and accessories shall be suitably boxed, crated, covered and protected internally and externally to prevent shipping damage and damage from the weather.

B. Inspect and report concealed damage to carrier within specified time.

C. Store in a clean, dry space. Maintain factory protection or cover to keep out dirt, water, construction debris, and traffic (heat enclosures to prevent condensation).

PART 2 – PRODUCTS

2.1 VARIABLE SPEED PACKAGED PUMPING SYSTEM WITH INTEGRATED VARIABLE FREQUENCY DRIVE MOTORS

A. Furnish and install a prefabricated and tested variable speed packaged pumping system to maintain constant water delivery pressure.

B. The packaged pump system shall be a standard product of a single pump manufacturer. The entire pump system including pumps and pump logic controller shall be designed and built by the same manufacturer.

C. The complete packaged water booster pump system shall be certified and listed by UL (Category QCZJ – Packaged Pumping Systems) for conformance to U.S. and Canadian Standards.

2.2 PUMPS

A. All pumps shall be ANSI/NSF 61 approved for drinking water.

B. The pumps shall be of the in-line vertical multi-stage design.

C. The head capacity curve shall have a steady rise in head from maximum to minimum flow within the preferred operating region. The shut-off head shall be a minimum of 20% higher than the head at the best efficiency point.

D. Small vertical in-line multi-stage pumps (nominal flow from 3 to 125 gallons per minute) shall have the following features:

1. The pump impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement.
2. The suction / discharge base shall have ANSI Class 250 flange or internal pipe thread (NPT) connections as determined by the pump station manufacturer.
3. Pump Construction:

Suction/discharge base, pump head, motor stool	Cast Iron (Class 30)
Impellers, diffuser chambers, outer sleeve	304 Stainless Steel
Shaft	316 or 431 Stainless Steel
Impeller wear rings	304 Stainless Steel
Shaft journals and chamber bearings	Silicon Carbide
O-rings	EPDM
Shaft couplings for motor flange sizes 184TC and smaller shall be made of cast iron or sintered steel. Shaft couplings for motor flange sizes larger than 184TC shall be made of ductile iron (ASTM 60-40-18)	
Optional materials for the suction/discharge base and pump head shall be cast 316 stainless steel (ASTM CF-8M resulting in all wetted parts of stainless steel.	

4. The shaft seal shall be a balanced o-ring cartridge type with the following features:

Collar, Drivers, Spring	316 Stainless steel
Shaft Sleeve, Gland Plate	316 Stainless Steel
Stationary Ring	Silicon Carbide
Rotating Ring	Silicon Carbide
O-Rings	EPDM
The Silicon Carbide shall be imbedded with graphite.	

5. Shaft seal replacement shall be possible without removal of any pump components other than the coupling guard, shaft coupling and motor. The entire cartridge shaft seal shall be removable as a one-piece component. Pumps with motors equal to or larger than 15 HP (fifteen horsepower) shall have adequate space within the motor stool so that shaft seal replacement is possible without motor removal.

2.3 INTEGRATED VARIABLE FREQUENCY DRIVE MOTORS

A. Each motor shall be of the integrated Variable Frequency Drive design consisting of a motor and a variable frequency drive (VFD) built and tested as one unit by the same manufacturer.

B. The VFD shall be of the PWM (Pulse Width Modulation) design using current IGBT (Insulated Gate Bipolar Transistor) technology.

C. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of motor. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump control and to eliminate the need for motor de-rating.

D. The VFD shall utilize an energy optimization algorithm to minimize energy consumption. The output voltage

E. The VFD shall automatically reduce the switching frequency and/or the output voltage and frequency to the motor during period of sustained ambient temperatures that are higher than the normal operating range. The switching frequency shall be reduced before motor speed is reduced.

F. An integral RFI filter shall be standard in the VFD.

G. The VFD shall have a minimum of two skip frequency bands which can be field adjustable.

H. The VFD shall have internal solid-state overload protection designed to trip within the range of 125% - 150% of rated current.

I. The integrated VFD motor shall include protection against input transients, phase imbalance, loss of AC line phase, over-voltage, under-voltage, VFD over-temperature, and motor over-temperature. Three-phase integrated VFD motors shall be capable of providing full output voltage and frequency with a voltage imbalance of up to 10%.

J. The integrated VFD motor shall have, as a minimum, the following input/output capabilities:
1. Speed Reference Signal: 0-10 VDC, 4-20mA
2. Digital remote on/off
3. Fault Signal Relay (NC or NO)
4. Fieldbus communication port (RS485)

K. The motor shall be Totally Enclosed Fan Cooled (TEFC) with a standard NEMA C-Face, Class F insulation with a temperature rise no higher than Class B.

L. The cooling design of the motor and VFD shall be such that a Class B motor temperature rise is not exceeded at full rated load and speed at a minimum switching frequency of 9.0 kHz.

M. Motor drive end bearings shall be adequately sized so that the minimum L10 bearing life is 17,00 hours at the minimum allowable continuous flow rate for the pump at full rated speed.

2.4 PUMP SYSTEM PROGRAMMING

A. Pump system programming (field adjustable) shall include as a minimum the following:
1. Water shortage protection (analog or digital)
2. Transducer Settings (Suction and Discharge Analog supply/range)
3. PI Controller (Proportional gain and integral time) settings.
4. High System pressure indication and shut-down
5. Low system pressure indication and shut-down
6. Low suction pressure/level shutdown (via digital contact)
7. Low suction pressure/level warning (via analog signal)
8. Low suction pressure/level shutdown (via analog signal)
9. Flow meter settings (if used, analog signal)

PART 3 - EXECUTION

3.1 FACTORY FABRICATION

A. All of the above equipment will be mounted on an open structural steel I-beam skid. All piping, pressure sensing lines, pump by-pass, shut-off valves, stuffing box and casing relief valve drains will be firmly anchored to the steel base by means of structural steel supports. All electrical wiring between controllers and drivers will be completed and tested at the factory. The entire package will require one power connection by the electrical contractor.

3.2 INSTALLATION

A. Installation shall be in accordance with manufacturer’s instructions.

3.3 FIELD ACCEPTANCE AND START-UP SERVICE

A. The service of a factory-trained representative shall be made available on the job site to check installation, field acceptance testing, start-up and instruct operating personnel.

B. In order to ensure the pump unit is properly coordinated and will function in accordance with the intent of these specifications, all the equipment required to comprise the pump unit will be supplied

by the pump manufacturer in whom shall be vested unit responsibility for the proper function of the complete pump unit including the pump, motor or engine, base plate, control equipment and other required accessories.

C. To verify compliance with this requirement, the pump manufacturer will be required to submit a notarized Certificate of Compliance certifying that all components of the pump unit were in fact supplied by the pump manufacturer and acknowledging its responsibility for the proper function of the unit.

3.4 GUARANTEE

A. The pumping system shall be guaranteed in writing, by the manufacturer for a period of one year from date of shipment against defect in design, material or construction.

END OF SECTION

SECTION 22 12 24

FIBERGLASS NON-PRESSURE WATER STORAGE TANKS

PART 1 – GENERAL

1.1 DESCRIPTION

A. A fiberglass reinforced bolted panel type water storage tank, complete, modular pedestal steel footings, flanges, piping, drains, materials, labor, equipment and all accessories as required.

1.2 QUALITY ASSURANCE

A. Criteria:
1. Manufacturer regularly and presently manufactures the item submitted as one of their principle products.
2. Installer, or supplier of a service, has technical qualifications, experience, trained personnel, and facilities to perform the specified work.
3. Product is certified to the sanitary requirements of NSF 61.
4. Product is in compliance to ASCE 7-05; Minimum Design Loads for Buildings and Other Structure, AWWA D121-12.
5. Manufacturer fabricates in ISO 9001: 2008 facilities.

B. Design Code: American Society of Civil Engineers (ASCE) Buildings and Other Structures – Allowable Minimum Design Load
1. IBC and Local Building Codes

1.3 SUBMITTALS

A. Submit in accordance with Section 22 05 12, Shop Drawings, Product Data and Samples.

B. Manufacturers' Literature and Data:
1. Materials
2. Dimensions
3. Fabrication
4. Bolts & Nuts
5. Sealing Materials
6. Reinforcements and Supports
7. Roof and Side Manhole Cover
8. Air Vent
9. Support Stands and Ladders
10. Flanges

C. Detailed shop drawings.

1.4 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the test by the basic designation only.

B. American Society of Civil Engineers (ASCE): Minimum Design Loads for Building and Other Structures – ASCE / 7-05.

C. American Society for Testing and Materials (ASTM)

D. International Building Code: 2009 (IBC)

E. NSF INTERNATIONAL (NSF) NSF / ANSI 61 (2010) Drinking Water System Components – Health Effects

PART 2 – PRODUCTS

2.1 TANK

A. Tank design FRP Panel Type Water Tank shall be in compliance wot ASCE 7-05: Minimum Design Loads for Buildings and Other Structures, AWWA D121-12 and fabricated in ISO 9001:2008 facilities.

B. The water tank must be certified to the sanitary requirements of NSF 61.

C. Tanks shall be constructed in metric modular panels in configurations of 2m x 1m / 1m x 1m / 1.5m x 1m / 2m x 0.5m / 1.5m x 0.5m / 1m x 0.5m / 0.5m x 0.5m.

D. Acceptable alternative: 316 stainless steel tank.

2.2 MATERIALS

A. Materials for panels production shall be Isophtalic unsaturated polyester resin to conform to ASTM specifications: D638, D695, D790 and D792, and the glass fiber used shall be non-alkali type conforming to ISO 1172.

B. Manufacturing process of panel shall be a Hot Press Molding System at 300 degrees F (150 degrees C) temperature and 3000 psi (20.5 MPA) with curing characteristics conforming to ISO-12114 and shrinkage properties to ISO-2677. The Sheet Molding Compound (S.M.C.) Raw Material shall be conforming to ISO-10352 and from an approved NSF 61 supplier.

C. SMC forming panels shall be externally reinforced with F/G roving mesh of density not less than 87 oz/ft2 (230 g/m2) before the hot pressing process.

D. Panels shall be of Fire Class 2 or B or better with a flame spread index of 70 and a smoke development index of 450, conforming to ASTM E84 – 12 Standard.

E. Panels and covers shall be of gray color in accordance to Munsell’s value N-7.0 to prevent light transmission, conforming to ASTM E903-96, in order to avoid algae growth inside the tank. (Value of light transmission shall not exceed 0.00%).

2.4 DIMENSIONS

A. Tolerance on each panel shall be within +/-0.03% of the nominal dimensions.

B. Tolerance with regard to panels and flange angle shall be within +/-0.3 degrees.

2.5 FABRICATION

A. F.R.P. Panels shall be externally flanged at 90 degrees on four sides.

B. Thickness of flange for roof panels shall not be less than ¼” (6mm) with a landed width of not less than 1-1/4 inch (56mm). Other panels’ flange shall not be less than 13/32 inch (10mm) and the landed width of all flanges shall not be less than 3 inches (75mm).

2.6 ACCESSORIES

A. Bolt and Nuts:
1. Bolts, nuts and washers for external fixing shall be of hot dipped galvanized steel grade 8.8, and for internal fixing of stainless steel A4-316 and shall conform to the requirements of ASTM A307, ASTM A325, ASTM A490, ASTM F593 or DIN 933 (for bolts) and ASTM A194, ASTM A563 or DIN 934 (for nuts).
2. Bolt sets for connecting the flanges of inlet, outlet, overflow and drainage to water tanks shall be of food grade rubber capped type.
3. Diameter of main fixing bolts and nuts shall be not less than ½ inch (12mm) and at a rate of eight bolt sets per linear meter.

B. Sealing Materials:

1. Sealant materials used for joints shall be chemically stable, non-toxic, flexible, and resistant to ultraviolet rays and must be certified for non-toxicity in accordance to NSF 61.
2. Material for the main sold sealant shall be made of S.E.B.S. (Stylene Ethylene Butyrene Styrene) i.e. solid synthetic rubber whereas material for the roof sealant shall be made of EPDM Rubber.
3. The main sealant shall be ribbed in not less than four locations. These ribs shall be continuous along the length of the sealant without any breaking. Such main sealant shall remain flexible and resistant to ultraviolet rays.
4. The main sealant shall be certified to NSF 61. Test report to be provided. Toxicology reviewed for the effect on taste, odor, color and turbidity, toxic metals, cytotoxicity, microbiological growth. Such tests shall be performed by an accredited laboratory.

C. Reinforcements and Supports of Water Tank:
1. Water tanks shall be strengthened externally with hot-dipped galvanized steel reinforcement conforming to ASTM A123.
2. Internal reinforcements for FRP Panel tanks, if required by manufacturer, shall be of stainless steel, grade A4-316.
3. Support poles of ceiling panels shall be uPVC pipes or FRP pipe according to tank height and proper structural design.
4. Brackets securing the roof tank covers shall be made of food-grade high density polyurethane material.

D. Roof Manhole Cover:
1. The roof manhole panel shall have a 30 inch (760mm) diameter clear opening and access door fixed with stainless steel hinges and lock device.
2. he access door shall be designed to open at 135 degree radius and to be detachable if required.
3. The access door shall be hermetically closed and light, dust and insect proof.

E. Air Vent shall be made of 4 inch diameter (100mm) with net of mesh No. 22 and shall be light, dust and insect proof.

F. Ladders and safety devices shall be provided and location of ladders shall be as shown on the drawings. In addition, safety cage, rest platforms, roof ladder handrails, and other safety devices shall be provided as required by federal or local laws or regulations.
1. Tanks above 3.3 feet (1m) high shall have one external and one internal ladder fitted to every manhole access.
2. The external ladder shall be made of hot dipped galvanized steel conforming to ASTM A123.
3. The internal ladder shall be made of FRP food grade material conforming to NSF61.

2.7 FLANGES

A. Flanges shall be made of UPVC full face high pressure bolted type with EPDM rubber gasket, ribbed in at least two locations.

B. Flanges shall be fixed to the tank panels with hot dipped galvanized, food grade and ultraviolet resistant type rubber capped bolts.

C. Overflow opening shall be sized to exceed the tank fill rate of the automatic fill valves if fails to open. Refer to plans for overflow size. Must meet NFPA 22, 14.6 and City of Houston Table 607.7 “sizes of overflow pipes for water supply tanks”.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Tanks shall be installed in accordance with manufacturer’s requirements.

B. A detailed installation manual and method statement shall be provided by the manufacturer and tank execution shall be done accordingly.

3.2 LEAKAGE TEST

A. Comply with AWWA D121-12 requirements (AWWA D121-12 Section 10.2). Once assembled the tank should be slowly filled with water to just beyond the first horizontal joint line which is normally at 3.3 foot (1m). Walk around and inspect all joints and penetrations for leakage. Continue to fill tank slowly and repeat the process of a walk around visual inspection at each horizontal joint level until the tank is full. Leave the tank full for a period of at least 24 hours and do a final leakage / general conditions walk around inspection.

END OF SECTION

SECTION 22 12 25

LIQUID LEVEL CONTROL PANEL FOR SURGE TANKS

PART 1 – GENERAL

1.1 GENERAL

A. Specifications for a Model ET13F4B2T1 Level Control Panel as manufactured by Cougar Controls, a business unit of Cougar Systems, LLC, Houston, TX. The contractor shall furnish and install the ET13 Series Level Control Panel as specified herein.

B. Incoming pump power shall be single phase, 60 Hz, 115/120 VAC (Specify site voltage).

1.2 CERTIFICATION

A. The panel shall be built by a UL 508A approved control systems manufacturer (Cougar Controls, a business unit of Cougar Systems, LLC) and 100 Percent tested at the factory prior to shipping.

B. Panels containing intrinsically safe circuits shall be built by a UL 698A approved control systems manufacturer (Cougar Controls, a business unit of Cougar Systems, LLC) and 100 Percent tested at the factory prior to shipping.

1.3 WARRANTY

A. The single phase level control panel shall be warranted in writing against defects in materials and workmanship under normal use and service for a period of three (3) years from the date of shipment when installed and used in accordance with the manufacturer recommendations.

PART 2 – PRODUCTS

A. The enclosure shall be at a minimum Type 4X rated with lockable latches approved for indoor and outdoor environments.

B. LED Red Daylight visible, flashing alarm beacon, mounted on the top of the enclosure.

C. Alarm buzzer.

D. For outdoor applications, the enclosure shall have dead-front swing panel construction.

E. UL489 single pole main disconnect, 7 amp.

F. (2) conductivity critical high level relay.
1. Redundant relay operation protects against PLC or sensor failure system upset.

G. The front panel indicators shall include:
1. (4) Fill Valve 3-polition selector switch, Close-Open-Auto, green illuminated LED
   a. 120VAC power to open
   b. Solenoid operation
2. (2) Block Valve 3-position selector switch, Close-Open-Auto, red illuminated LED.
   a. 120VAC power to close
   b. 120VAC power to open
   c. L1 and neutral for enclosure heater
   d. Motor operated valve.
3. (1) Domestic Back-up High Level Alarm Red LED Indicator
4. (1) Fire Back-Up High Level Alarm RED Indicator.
5. LED backlit Digital Touchscreen

H. Touchscreen HMI functions as follows:
1. Lead Fill Valve Selection
2. Alarm Silence Button

3. "High Level Alarm" Indication
4. "Low Level Alarm" Indication
5. Continuous Level Readout, in inches (other scales available upon request)
6. Level Settings including:
   a. Level sensor span
   b. Level readout offset
   c. Level display refresh rate
   d. Alarm reset differential
   e. Alarm on-delay timer, seconds (range 0-9999)
   f. High level alarm setpoint
   g. Low level alarm setpoint
   h. Fill Valve(s) close
   i. Fill valve Lead open
   j. Fill valve Lag open

I. The panel shall be equipped with a remote monitoring dry contact for General Alarm. The General alarm contact shall be normally closed to indicate a power failure or loss of system control.

J. (2) BAS Dry contact for High Level Alarm

K. (2) BAS Dry contact for Low Level Alarm
1. All field terminations located in one location, segregated by voltage.
2. Adjacent labeling, sensors, BAS interface, incoming power, valve wiring.

L. Heat shrink wire markers with circuit voltage indication.

M. Supply one set of spare fuses.

N. Panel nameplate shall be permanently affixed inside the enclosure displaying panel model number, serial number, voltage, phase, and SCCR ratings. There shall be a schematic drawing located on the inside of the enclosure for field personnel

O. Control panel shall be a Model ET13F4B2T1 Level Control Panel as manufactured by Cougar Controls, a business unit of Cougar Systems, LLC, Houston, TX.

PART 3 – INSTALLATION

3.1 Installation shall be provided by Cougar Controls, a business unit of Cougar Systems, LLC, Houston, TX.

END OF SECTION

SECTION 22 13 16

SOIL, WASTE AND SANITARY DRAIN PIPING, VENT PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install piping in buildings and underground laterals to 5 foot outside of building.

1.2 RELATED WORK

A. Site Work:
1. Sanitary Sewers
2. Excavation, Trenching and Backfilling for Utilities

B. Division 22 Plumbing:
1. Pipe and Pipe Fittings
2. Plumbing Fixtures and Fixture Carriers
3. Drains, Cleanouts and Hydrants
4. Earthwork

1.3 REFERENCES

A. CISPI - Cast Iron Soil Pipe Institute

B. ASTM - American Society for Testing and Materials

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All No-Hub clamps must have 4 bands minimum. Sizes 5” through 10” shall have six bands minimum.
1. No-Hub Clamps – Sanitary Waste:
a. Husky SD 4000
b. Clamp-All Hi Torq 125
2. No-Hub Clamps - Vents
a. Husky SD – 2000
b. Mission Rubber Co., LLC Heavy Weight Couplings
c. Clamp-All Hi-TorQ 80 or approved equal

B. Provide Anaco-Husky shielded couplings Series 4200 with one piece neoprene gasket for all cast iron pipe transitions to Schedule 40 DWV pipe penetrations through slabs. Sizes 1-1/2” through 8” Series 4200.

C. Cast Iron Soil Pipe and Fittings:
1. AB&I
2. Charlotte Pipe and Foundry Co.
3. Tyler Pipe / Soil Division

2.2 DRAIN PIPE AND FITTINGS

A. Above Slab Pipe:
1. No-hub cast iron soil pipe and fittings shall conform to CISPI 301 and ASTM A888.
2. Pipe shall conform to ASTM A74.
3. No-hub couplings shall meet or exceed the latest specification standard CISPI 310 or ASTM C-1540 and conform to FM 1640. CISPI 310 Couplings shall be listed by NSF International.
4. Rubber Gaskets for cast iron soil pipe and fittings shall conform to ASTM C564
5. All Cast Iron Soil Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute

B. Below Slab on Grade Piping:
   1. Schedule 40 PVC plastic pipe and DWV fittings.
   2. Solvent welded DWV joints shall conform to IAPMO Installation Standard IS-9.
   3. Pipe and fittings shall conform to ASTM D 1784, ASTM D 1785, ASTM D 2665, ASTM D 3311 and NPS Standard 14 & 61.

C. Below Slab on Grade Piping for Grease Waste:
   1. Schedule 40 CPVC pipe and fittings
   2. Solvent welded DWV joints shall conform to ASTM D3311 and be produced to dimensions specified in ASTM F 2618, NSF International, UPC, IAPMO IGS 210 and International Plumbing Code.
   3. Solvent Cement, Heavy Body; mustard yellow color, as tested by ASTM F 2618 / ASTM F493
   4. Manufacturer: Spears (only)

2.3 VENT PIPE AND FITTINGS

A. Above Slab Pipe:
   1. No-hub cast iron soil pipe and fittings shall conform to CISPI 301 and ASTM A888.
   2. Pipe shall conform to ASTM A74.
   3. No-hub couplings shall conform to CISPI 310 and shall be listed by NSF International
   4. Rubber gaskets for cast iron soil pipe and fittings shall conform to ASTM C564

B. Below Slab on Grade Piping:
   1. Provide Schedule 40 PVC with DWV fittings with solvent welded joints. Pipe and fittings shall conform to ASTM D1784-82.

C. Above Slab Pipe.
   1. Drainage-waste-vent copper pipe and fittings for waste stub-outs for all fixture locations and equipment discharge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All above and below slab soil, waste, sanitary drain and vent piping installation methods shall be in accordance with Cast Iron Soil Pipe Institute Standards.

B. Above ground installation in the horizontal position shall be supported at every hub (hub & spigot or hubless type). Hangers are to be placed within 18” of hub or coupling. For large diameter fittings, 5 inches and larger shall be braced to prevent horizontal movement. Every branch opening or change of direction, braces, blocks, rodding or other suitable method shall be used to prevent movement. Riser clamps to be used for each floor, not to exceed 15’-0”.

C. All above and below slab PVC sanitary waste and vent piping installation methods shall be in accordance with IAPMO Installation Standard 18-9 for Schedule 40 PVC-DWV, per manufacturer’s recommendations and applicable standards.

D. Tracer wires shall be installed on all underground PVC sanitary sewer lines installed outside the building slab.

E. All PVC underground shall be installed in accordance with ASTM D2321.

3.2 GRADE

A. Give horizontal pipe grade of ¼-inch per foot where possible, but not less than 1/8 inch per foot unless otherwise shown.

3.3 DRAIN PIPE AND FITTINGS

A. Offsets and Fittings.
   1. Use reduction fittings to connect two pipes of different diameter.
   2. Change directions by appropriate use of 45-degree wyes, long-sweep quarter-bends, and sixth-, eights-, and sixteenth-bends. Sanitary tees can be used on vertical stacks. Use long sweeps at the base of risers.
   3. Provide a separate trap at each fixture, unless a trap is built into the fixture. Provide a deep seal trap at each floor drain and hub drain. Place traps so that the discharge from any fixture will pass through only one trap before reaching a building drain.
   4. Refer to Sanitary Drainage Code section for acceptable fittings to be used for changes in direction of drainage flow. Double combo sanitary fittings or double wye and 1/8th bend fittings are not allowed for horizontal to horizontal piping systems per Code.

B. Hub Drains. Install hub drains where indicated, with the top of the hub 1/2 above the finished floor, unless otherwise indicated on the drawings.

C. Cleanouts. Install cleanouts the same size as the soil waste lines in which the cleanouts are placed; however, no cleanout should be larger than 4 inches in diameter.
   1. Where cleanouts occur in pipe chases, bring the cleanouts through the walls and install covers. Where cleanouts occur in floor slabs, set flush. Reference drawing schedule.
   2. Provide cleanouts where soil lines change direction, every 50 foot on long runs, or as shown on the drawings, at the end of each horizontal waste line, and at the base of each riser (and at each increase in pipe size).
   3. Cleanouts shall occur at the end of each battery of water closets, urinals, lavatories, sinks, and single water closets. Cleanouts shall be installed so as to access the main sanitary or soil line. Extend and offset above flood rim of water closet.
   4. Double sanitary tees and double quarter bends do not allow for easy access to main lines, therefore these types of fittings are not allowed.

D. Floor Drains. Locate floor drains 1/2-inch below finish floor elevation unless otherwise shown.

3.4 VENT PIPING

A. Make vent connections to vent stacks with inverted wye fittings. Extend full-size vents through the roof to at least 6 inches above the roof.

B. Flash the roof penetration with 6 lb. lead flashing approximately 24 inches square. Flange the flashing to the lead sleeve. Extend the flashing up and around the vent pipe. Turn the flashing down inside the pipe at least 2 inches to make a watertight joint. Flashing shall comply with the roofing manufacturer's requirements. Reference the Architectural Drawings for exact requirements.

C. Locate vent piping through roof a minimum horizontal distance of not less than 20 feet from any air intake opening or supply fan.

3.5 TESTING

A. Below Slab on Grade and All Floors in Multi-Story Buildings:
   1. Test pipe below slab on grade before backfilling and connecting to city sewers.
   2. Maintain not less than 10 foot of hydrostatic head for1 hour without a leak.
   3. Before acceptance of the work the contractor must ensure the piping is in working order before and after the slab is poured. To ensure this the contractor must test completed systems in the presence of the Architect, Engineer and authorities having jurisdiction after installation is complete.
   4. Maintain the test on the system till after the slab is poured. Provide an accessible connection that may be reviewed by Architect, Engineer and authorities having jurisdiction prior to and after the slab is poured.
   5. Test drainage piping systems in accordance with governing codes and the requirements specified. Provide equipment and materials and make test connections required to execute tests.
   6. Test drainage and waste piping hydraulically by filling system to its highest point or, whichever is greater, at a static head of 10 feet. Leaks at any joint shall be sufficient cause for rejection.

7. Air tests may be substituted for hydraulic tests by forcing air into the closed system at a uniform pressure sufficient to balance a column of 10 inch hg in height.
8. Under any of the previously described tests, the water height shall remain constant, after stabilization, for not less than 15 minutes without any further addition of water.

B. System Test. After the various sections of soil, waste and vent piping are installed, but before fixtures are connected, test the system by:
1. Plugging outlets.
2. Filling vertical sections of multiple story buildings of not less than three floors at a time with water. Provide wyes as required to facilitate plugging.
3. Test for 6 hours without any drop in the water level.

3.6 RODDING SEWERS

A. All sanitary soil and waste lines, both in the building and out, shall be rodded out and flushed out after completion of construction and prior to finish floor being installed. All work must be completed prior to substantial completion. All floor drains and cleanout locations must be included in this work.

B. All sanitary soil and waste lines below building 3” and larger shall be internally videotaped at time of substantial completion. All videotaping shall include on-screen date and time, and include audio narration. All videotaping shall be provided by experienced individual in videotaping piping systems. An Owner’s Representative shall be present during video-taping. Three copies of the videotape shall be delivered to the Owner for future records.

C. This work shall be done in the presence of the Owner’s Representative, as part of the Contract, to ensure all lines are clear, and any obstruction that may be discovered shall be removed immediately. Rodding shall be accomplished by utilizing the proper rotary head to clear sewer. Pipe sizes 8 inches and larger shall be hydro-flushed.

3.7 SMOKE TESTING

A. Interior Plumbing Piping:
1. Contractor shall perform smoke testing on all interior sanitary sewer piping and sanitary vent piping above and below floor prior to cover-up..
2. Artificially created smoke used must be a persistent white tracer smoke and produced by thermogenic chemical reaction. All smoke candles or smoke pencils to be used must be non-toxic and EPA approved. Provided by Superior Signal Smoke Candles.
3. All plumbing fixtures must be installed including floor drains with wetted trap seals.
4. Smoke testing shall be performed after completion of any videotaping, rodding or flushing of the sanitary system. Test must be performed prior to ceiling installation in new construction projects. Smoke is usually injected into the building through the two-way cleanout in the main sewer line leaving the building or a plumbing roof vent or fixture. Smoke will travel through the sanitary sewer and vent system and through the air spaces in the sewer lines and emanate from any leaks in the system. The smoke must reach the last roof vent in the system to indicate the entire system has been completely filled with smoke. The smoke must travel the full length of the piping system. Contractor must provide manpower as necessary to visually trace the flow of smoke through the wall cavities, annular floor/ceiling spaces, inject the smoke, observe the roof vents and to identify the integrity problems.
5. Contractor shall provide a detailed list of findings and a drawing indicating the location, fixture type, type and size of pipe, and or description of type of problems found.
6. Typical findings from indoor smoke testing may include:
   a. Dry traps in floor drains
   b. Improperly capped sewer lines or vents
   c. Broken sewer lines or vents
   d. Cross connected sewer vents and drains
   e. The drawing of air emanating from sewer vents into intakes of air exchange systems
   f. Poorly glued pipe joints
   g. Loose no-hub couplings
7. An Owner’s Representative shall be present during smoke testing.

END OF SECTION

SECTION 22 14 13

ROOF DRAINAGE PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install roof drains, drain pipes and accessories.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Pipe and Pipe Fittings - General; for general piping requirements.
2. Drains and Cleanouts.
3. Plumbing Piping Insulation.
4. Earthwork

1.3 REFERENCES

A. CISPI – Cast Iron Soil Pipe Institute

B. ASTM – American Society for Testing and Materials

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cast Iron Soil Pipe and Fittings
1. AB&I
2. Charlotte Pipe and Foundry Co.
3. Tyler Pipe / Soil Division

2.2 STORM PIPE AND FITTINGS

A. Above Ground Pipe. Provide service weight cast iron Hub and Spigot soil pipe and fittings with compression type neoprene gaskets that conform to ASTM C-564. Pipe and fittings shall meet the requirements of ASTM A 74. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.

B. Below Slab on Grade: Provide Schedule 40 PVC plastic pipe and DWV fittings with solvent welded joints. Pipe and fittings shall conform to ASTM D 1784-82.

C. Provide Anaco-Husky shielded couplings, Series 4200 with one-piece neoprene gasket for cast iron pipe transitions to Schedule 40 DWV pipe penetrations through slabs. Sizes 2” through 8” use Series 4200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All above and below slab storm piping installation methods shall be in accordance with the Cast Iron Soil Pipe Institute Standards.

B. Above ground installation in the horizontal position shall be supported at every hub (hub & spigot or hubless type). Hangers to be placed within 18” of hub or coupling. For large diameter fittings, 5 inches and larger shall be braced to prevent horizontal movement. Every branch opening or change of direction, braces, blocks, rodding or other suitable method shall be used to prevent movement. Riser clamps to be used for each floor, not to exceed 15’-0”.

C. All above and below slab PVC storm piping installation methods shall be in accordance with IAPMO Installation Standard 18-9 for Schedule 40 PVC-DWV, per manufacturer’s

recommendations and applicable standards, and in accordance with ASTM D2321.

3.2 GRADE

A. Give horizontal lines minimum grade of 1/8 inch per foot.

3.3 TESTING

A. Below Slab on Grade and All Floors in Multi-Story Buildings:
1. Test pipe below slab on grade before backfilling and connecting to city sewers.
2. Maintain not less than 10 foot of hydrostatic head for1 hour without a leak.
3. Before acceptance of the work the contractor must ensure the piping is in working order before and after the slab is poured. To ensure this the contractor must test completed systems in the presence of the Architect, Engineer and authorities having jurisdiction after installation is complete.
4. Maintain the test on the system till after the slab is poured. Provide an accessible connection that may be reviewed by Architect, Engineer and authorities having jurisdiction prior to and after the slab is poured.
5. Test drainage piping systems in accordance with governing codes and the requirements specified. Provide equipment and materials and make test connections required to execute tests.
6. Test drainage and waste piping hydraulically by filling system to its highest point or, whichever is greater, at a static head of 10 feet. Leaks at any joint shall be sufficient cause for rejection.
7. Air tests may be substituted for hydraulic tests by forcing air into the closed system at a uniform pressure sufficient to balance a column of 10 inch hg in height.
8. Under any of the previously described tests, the water height shall remain constant, after stabilization, for not less than 15 minutes without any further addition of water.

B. System Test. After the various sections of soil, waste and vent piping are installed, but before fixtures are connected, test the system by:
1. Plugging outlets.
2. Filling vertical sections of multiple story buildings of not less than three floors at a time with water. Provide wyes as required to facilitate plugging.
3. Test for 6 hours without any drop in the water level.

3.4 RODDING SEWERS

A. All storm sewer lines, both in the building and out, shall be rodded out and flushed out after completion of construction and prior to finish floor being installed. All work must be completed prior to substantial completion. All floor drains and cleanout locations must be included in this work.

B. All storm lines below building 3” and larger shall be internally video-taped at time of substantial completion. An Owner’s Representative shall be present during video-taping. Three copies of the video-tape shall be delivered to the Owner for future records.

C. This work shall be done in the presence of the Owner’s Representative, as part of the Contract, to ensure all lines are clear, and any obstruction that may be discovered shall be removed immediately. Rodding shall be accomplished by utilizing a rotary cutter, which shall be full size of pipe being cleaned for pipe sizes up to 6 inches. Pipe sizes 8 inches and larger shall be hydro-flushed.

END OF SECTION

SECTION 22 20 00

PLUMBING PIPE AND PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install pipe and pipe fittings for piping systems specified in Division 22 - Plumbing.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Earthwork
2. Valves, Strainers and Vents
3. Insulation
4. Other Piping Sections

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. The particular type of pipe and fittings for each system is specified in the individual sections.

2.2 JOINTS

A. Make screwed joints using machine cut USASI taper pipe threads. Apply a suitable joint compound to the male threads only. Ream the pipe to full inside diameter after cutting. All-thread nipples are not permitted.

B. Dissimilar Metals. Make joints between copper and steel pipe and equipment using insulating unions or couplings such as Crane Company #1259; EPCO as manufactured by EPCO Sales, Inc.; or an approved equal.

C. Solder joints.
1. Prior to making joints, cut pipe square and ream to full inside diameter. Clean exterior of pipe and socket. Apply a thin coat of suitable fluxing compound to both pipe and socket, and fit parts together immediately.
2. Heat assembled joint only as required to cause the solder to flow. Run the joint full, slightly beaded on the outside, and wipe to remove excess solder.
3. Use silver brazing alloy or Sil-Fos on underground water entry piping. Use lead free solder on all other copper piping.

D. Make welded joints as recommended by the standards of the American Welding Society. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Keep inside of fittings free from globules of weld metal. The use of mitered joints is not approved.

E. Flanged.
1. Prior to installation of bolts, center and align flanged joints to prevent mechanical pre-stressing of flanges, pipe or equipment. Align bolt holes to straddle the vertical, horizontal or north-south centerline. Do not exceed 3/64" per foot inclination of the flange face from true alignment.
2. Use flat-face companion flanges only with flat-faced fittings, valves or equipment. Otherwise, use raised-face flanges.
3. Install gaskets suitable for the intended service and factory cut to proper dimensions. Secure with manufacturers recommended gasket cement.
4. Use ANSI nuts and bolts, galvanized or black to match flange material. Use ANSI 316 stainless steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets.
5. Use carbon steel flanges conforming to ANSI B16.5 with pipe materials conforming to ASTM A 105 Grade II or ASTM A 108, Grade II, ASTM A 53, Grade B. Use slip-on type

flanges on pipe only. Use welding neck type flanges on all fittings. Weld slip-on flanges inside and outside.

6. Keep flange covers on equipment while fabricating piping. Remove when ready to install in system.

F. No Hub. Hubless joints shall be made with wide body, neoprene sealing sleeve with stainless steel sleeve, coupling joints conforming to ASTM C 1277.
   1. 4" pipe size and smaller coupling housing minimum of 3" width; 24 gauge Series 300 stainless steel with hi-torque clamps; neoprene coupling gasket.
   2. 6" through 10" pipe size coupling housing minimum of 4" width.
   3. Tighten clamps to within manufacturer's tolerances using preset torque wrench.

I. Compression Gasket System. Bell and spigot cast iron pipe 4" and smaller, use flax-base lubricant, Tyler Ty-Seal Lubricant or Charlotte Regular Lubricant. 6" and larger use a neoprene base lubricant, Charlotte Adhesive Lubricant.

J. Ring-Tite Joints: Ring-Tite gasketed sewer fittings for sanitary and storm. Furnish joints for installation manufactured per ASTM/CSA, Ipex, and J.M Eagle C900. Provide adequate concrete thrust blocks at changes in direction, as recommended by manufacturer. JM Eagle pressure rated PVC water pipe. ASTM D2241 pressure rating, ASTM D3219 joints, gaskets ASTM F477.

M. Press fittings for copper pipe 1/2” to 4”: Copper press fittings shall conform to the material and sizing requirements of ASTM B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Pro-Press System manufactured by VIEGA. The system intended for use shall be approved by submittal. Systems from various manufacturers may vary in technology. The field personnel shall carry training credentials from the approved manufacturer for the project. Mixing of fittings from different manufacturers is strictly prohibited.

2.3 UNIONS

A. Use 150 lb. standard (300 lb. WOG) malleable iron, ground joint unions with bronze seat. Provide flanged joints on piping 2-1/2" and larger.
   1. Where pipe materials of different types join, use a dielectric union. Union shall be threaded, solder or as required for its intended use.

2.4 BRANCH CONNECTIONS

A. Pipe 2" and Smaller. For threaded piping, use straight size reducing tee. When branch is smaller than header, a nipple and reducing coupling or swagged nipple may be used.

B. 2-1/2" through 36": For welding piping, when branch size is the same as header size, use welding tee. Use Weld-o-let when branch is smaller than header. For threaded branch connections, use 3000 lb. full coupling or Thread-o-let welded to header.

2.5 GASKETS

A. High Temperature Piping. Provide 1/16" thick ring gaskets of aramid reinforced SBR such as Garlock #3200 or 3400 or equal by Advanced Products and Systems.

B. Other Piping. Provide ring rubber gaskets, Garlock #7992 or equal by Advanced Products and Systems. Use 1/8" thick cloth reinforced neoprene gaskets. For smaller than 6", use 1/16" thick gasket.

2.6 FLOORS AND CEILING PLATES

A. Provide chrome-plated floor and ceiling plates around pipes exposed to view when passing through walls, floors, partitions, or ceilings in finished areas; size plates to fit pipe or insulation and lock in place.

2.7 DOMESTIC MANUFACTURE

A. All piping material, pipe and pipe fittings shall be manufactured in the United States of America unless specifically named in these specifications.

PART 3 - EXECUTION

3.1 PIPE FABRICATION AND INSTALLATION

A. Make piping layout and installation in the most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work. Give particular attention to piping in the vicinity of equipment. Preserve the required minimum access clearances to various equipment parts, as recommended by the equipment manufactured, for maintenance.

B. Cut all pipes to measurement determined at the site. After cutting pipe, remove burrs by reaming. Bevel plain ends of ferrous pipe.

C. Install piping neatly, free from unnecessary traps and pockets. Work into place without springing or forcing. Use fittings to make changes in direction. Field bending and mitering is prohibited. Make connections to equipment using flanged joints, unions or couplings. Make reducing connections with reducing fittings only.

D. Install piping without tapping out of the bottom of pipe.

E. Press Connections: Copper and steel press fittings ½” through 4” shall be applied in accordance with the manufacturer’s installation instructions. The tubing/pipe shall be fully inserted into the fitting and the tubing/pipe marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing/pipe to assure the tubing/pipe is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer. If soldering (thread adapters, etc.) near press fittings, take precautions to not damage the O-ring fittings. Maintain three pipe diameters or use a cooling agent. Viega-“Pro-Press”.

3.2 WELD

A. Weld and fabricate piping in accordance with ANSI Standard B31.1, latest edition, Code for Pressure Piping.

B. Align piping and equipment so that no part is offset more than 1/16". Set fittings and joints square and true, and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

C. Do not permit any weld to project within the pipe so as to restrict flows. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.

D. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

E. Remove dirt, scale and other foreign matter from inside piping before tying into existing piping sections, fittings, valves or equipment.

F. Bevel ends of ferrous pipe.

3.3 OFFSETS AND FITTINGS

A. Due to the small scale of drawings, the indication of offsets and fittings is not possible. Investigate the structural and finish conditions affecting the work and take steps required to meet these conditions.

B. Install pipe close to walls, ceilings and columns so pipe will occupy minimum space. Provide proper spacing for insulation coverings, removal of pipe, special clearances, and offsets and fittings.

3.4 SECURING AND SUPPORTING

A. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved clevis-type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved clevis type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging.

B. Provide supports both sides of elbows for pipe 6" and larger.

C. Support vertical risers with steel strap pipe clamps of approved design and size, supported at each floor. Support piping assemblies in chases so they are rigid and self-supported before the chase is closed. Provide structural support for piping penetrating chase walls to fixtures. On cold water pipe, supports shall be outside the insulation.

D. Where insulation occurs, design hangers to protect insulation from damage. Pipe saddles and insulation shields, where required, are specified in the appropriate insulation section and are sized in accordance with the schedule on the drawings.

E. Install trapeze hangers, properly sized, to support the intended load without distortion.

F. Use electro-galvanized or zinc plated threaded rods, nuts, washers and hangers.

G. At outdoor locations, all supports, brackets and structural members shall be hot-dipped galvanized.

H. Support spacing: As recommended by the project structural engineer and support manufacturer, but not more than listed below. Not to exceed spacing requirements of smallest pipe.

Pipe Size	Copper & Steel Max. Support Spacing, Feet	Cast Iron Max. Support Spacing, Ft.	Minimum Rod Diameter, Inches
1" & smaller	6		3/8
1-1/4" & 1-1/2"	8	5	3/8
2"	10	5	3/8
3"	10	5	1/2
4" & 5"	10	5	5/8
6" and above	10	5	3/4

3.5 PIPE SUPPORTS

A. Provide P1001 or P 5000 Unistrut metal framing members and appurtenances for pipe support. Hot-dip galvanize members and appurtenances when located outside. Sagging of pipes or supports is not acceptable.

B. Adjustable clevis hangers shall be used for single pipe supports; Anvil Fig. 260. When oversized clevis is used, a nipple shall be placed over the clevis bolt as a spacer to assure that the lower U-strap will not move in on the bolt. Provide adjustable clevis with a nut / washer above and below the hanger on the support rod. Ring type clevis hangers are not acceptable.

C. Provide Anvil Figure 45 galvanized or primed and painted channel assembly for trapeze hangers.

3.6 PIPE SUPPORTS ON ROOF

A. Support gas pipe on roof with Portable Pipe Hanger Model PP-10 with roller and fully adjustable height throughout pipe run. Base material shall be high density / high impact polypropylene with UV inhibitors and anti-oxidants. Provide with hot dip galvanized rod finish and framing. Nuts and washers shall be hot dip galvanized.

3.7 ANCHORS

A. Provide anchors as required. Use pipe anchors consisting of heavy steel collars with lugs and bolts for clamping to pipe and attaching anchor braces. Install anchor braces in the most effective manner to secure desired results. Do not install supports, anchors or similar devices where they will

damage construction during installation or because of the weight or the expansion of the pipe. When possible, install sleeves in structural concrete prior to pouring of concrete.

3.8 FLOOR PENETRATIONS

A. At locations where pipe passes through floors, provide watertight concrete curb around penetration.

3.9 PIPE SLEEVES

A. Sleeves through masonry and concrete construction:
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe.
   2. Size sleeve large enough to allow for movement due to expansion and to provide continuous insulation.

B. Sleeves through gypsum wall construction.
   1. Fabricate sleeves of 16 gauge galvanized sheet metal.

C. Sleeves through elevated slab construction.
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe with welded center flange in floor.

D. Extend each sleeve through the floor or wall. Cut the sleeve flush with each wall surface. Sleeves through floors shall extend 2” above floor lines for waterproofing purposes. Slab on grade floors shall not be sleeved except where penetrating waterproofing membrane or insect control is required.

E. Caulk sleeves water and air tight. Seal annular space between pipes and sleeves with mastic compound to make the space water and air tight.

F. For sleeves below grades in outside walls, provide Thunderline Link-Seal or Advance Product and System Interlynx, with 316 stainless steel nuts and bolts, with cast iron pressure plate.

G. Provide chrome plated escutcheon plates on pipes passing through walls, floors or ceilings exposed to view. At exterior walls, stainless steel sheet metal is to be used.

H. For sleeves through fire and smoke rated walls, seal with a UL through-penetration firestop, rated to maintain the integrity of the time rated construction. Install in accordance with the manufacturer's installation instructions. Comply with UL and NFPA standards for the installation of firestops. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

3.10 ISOLATION VALVES

A. Provide piping systems with line size shutoff valves located at the risers, at main branch connections to mains for equipment, to isolate central plant, and at other locations.

3.11 DRAIN VALVES

A. Install drain valves at low points of water piping systems so that these systems can be entirely drained. Install a line size drain valve for pipes smaller than 2" unless indicated otherwise. For pipes 2-1/2" and larger, provide 2" drain valves unless indicated otherwise. Drain valves shall be plugged when not in use and at completion.

3.12 CLEANING OF PIPING SYSTEMS

A. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge and circulate.

B. Install temporary strainers at the inlet of pumps and other equipment as necessary where permanent strainers are not indicated. Keep strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blow down ball valve and pipe to nearest drain. Blow down strainers, remove and clean as frequently as necessary.

C. Phase One: Initial flushing of system. Remove loose dirt, mill scale, weld beads, rust and other deleterious substances without damage to system components. Open valves, drains, vents and strainers at all system levels during flushing procedures. Flush until “potable water clear” and particles larger than 5 microns are removed.

D. Connect dead-end supply and return headers, even if not shown on the drawings, and provide terminal drains in bottom of pipe end caps or blind flanges.

E. Dispose of water in approved manner.

F. Phase Two: Cleaning of Piping Systems. Remove, without chemical or mechanical damage to any system component, adherent dirt (organic soil), oil, grease, (hydrocarbons), soldering flux, mill varnish, piping compounds, rust (iron oxide) and other deleterious substances not removed by initial flushing. Flush system and replace with clean water.

G. Phase Three: Final flushing and rinsing: Flush and rinse until “potable water clear” and particles larger than 5 microns are removed. Operate valves to dislodge any debris in valve body. Dispose of water in approved manner.

H. Submit status reports upon completion of each phase of work on each system.

3.13 TESTING

A. Test piping after installation with water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair leaks and retest system until proven watertight.

B. Do not insulate or conceal piping systems until tests are satisfactorily complete.

C. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.

D. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

3.14 PIPE MARKERS

A. Identify interior exposed piping and piping in accessible chases or plenums with Opti-Code Brady Pressure Sensitive Adhesive Pipe Markers, consisting of pipe marker and direction of flow arrow tape. Clean pipe prior to installation. Background colors of markers, arrows and tape for each type of system shall be the same. Meet ANSI/OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

B. Identify exterior and mechanical room piping with Snap Around pipe markers through 4-inch pipe and Strap Around markers 5-inch pipe and larger. Pipe markers consisting of pipe marker and direction of flow arrow tape; background colors of markers, arrows and type for each type of system shall be the same. Meet ANSI / OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

C. Install identification in the following locations:
1. Both sides of penetrations through walls, floors and ceilings.
2. Close to valves or flanges.
3. Intervals on straight pipe runs not to exceed 50 feet
4. Apply marker where view is obstructed.

D. Pipe markers shall meet or exceed the specifications of the ASME A13.1 “Scheme for Identification of Piping Systems”.

END OF SECTION

SECTION 22 33 33

ELECTRIC WATER HEATER (Commercial ASME)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electric water heaters for domestic water systems.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Domestic Water Piping.
2. Plumbing Piping Insulation.
3. Division 26 Electrical.

1.3 WARRANTY

A. Provide standard manufacturer’s 10 year commercial warranty for mechanical and electrical and 10 year warranty for leaks. Warranty shall start the date of the substantial completion certificate.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Lochinvar.

B. Bradford White

C. Rheem / Ruud

D. A. O. Smith

2.2 PRODUCTS

A. Provide electric water heaters with kilowatt, recovery ratings, and storage capacities as scheduled on drawings.

B. Provide an ASME code construction tank designed for 150 psig working pressure. Furnish glass-lined tank. Lining shall be corrosion-resistant.

C. Furnish factory-assembled, integral units equipped as follows:
1. Immersion thermostat.
2. High temperature limit switch (energy cutout).
3. Low-water cutoff.
4. Heavy duty UL rated for 100,000 cycles.
5. Temperature and pressure relief valve.
6. Anode rod.

D. Provide heavy-duty, medium watt density elements having nicoloy sheathing and prewired leads.

E. The entire vessel shall be enclosed in a round steel enclosure with baked enamel finish and shall enclose the tank with R-16 foam insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installations shall be in accordance with the manufacturer's published recommendations.

C. Furnish all supports required by the equipment included in this Contract.

D. Provide a 4" thick reinforced concrete housekeeping pad beneath heaters.

E. Furnish and install all necessary valves, traps, gauges, strainers, unions, etc. to facilitate proper functioning and servicing of equipment.
   1. Install a line size shutoff valve in cold water inlet and hot water outlet close to each heater.
   2. Provide a temperature gauge in the domestic hot water piping within five feet of outlet to each heater, upstream of all shut-off valves. Size and locate gauges to be easily readable from a standing position.

F. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric coupling or dielectric flange fitting.

G. Route condensate to a vented receiver.

H. Pipe relief valve discharge and all equipment drains indirectly to appropriate floor drain.

I. Set the operating and safety controls.

J. Set thermostats on domestic water heaters to delivery maximum water temperature as indicated on Contract Drawings.

K. Furnish and install an expansion tank on cold water supply to heater. Locate tank as close to water heater as possible between water heater and all check valves or backflow preventers. Expansion tank capacity shall be as scheduled on Contract Drawings. Install expansion tank in accordance with manufacturer's recommendations.

L. Install water heater in galvanized drain pan piped to floor drain. Elevate water heater tank bottom above drain pan as to not allow standing water inside of drain pan to touch bottom of tank.

3.2 STARTUP

A. Startup shall be performed by factory trained and authorized personnel. The factory representative shall also provide a technical and practical operation and maintenance training seminar including a hands-on operation and maintenance demonstration, and classroom presentation with handouts and visual aids, for no less than three physical plant personnel.

END OF SECTION

SECTION 22 34 32

GAS-FIRED DOMESTIC WATER HEATER (Cyclone)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Gas-fired domestic hot water heating systems, including hot water heaters, storage tanks, control valves, and pressure and temperature relief valves, as required.

1.2 RELATED ITEMS

A. Division 22 Plumbing:
1. Domestic Water Piping
2. Gas Piping
3. Flue Piping
4. Plumbing Piping Insulation

1.3 CERTIFICATION

A. Provide water heater listed by UL Laboratories, according to ANSZ21.10 Standards governing storage-type water heaters. Must meet ASHRAE/IESNA 90.1-1999 and be design-certified by Underwriter's Laboratories for 180°F water. Must meet SCAQMD Rule 1146.2 for low-nox emissions.

1.4 WARRANTY

A. Provide standard manufacturer's 10 year commercial warranty for mechanical and electrical and 10 year warranty for leaks. Warranty shall start the date of the substantial completion certificate.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. A.O. Smith

B. PVI

C. Lochinvar

D. Bradford White

2.2 CAPACITY

A. Water heaters shall have the storage capacity and gallons per hour recovery at 100°F rise as scheduled.

2.3 TANK

A. Construct the tank with a 125 psi ASME rating in accordance with the ASME Code, Section IV. Tank shall have a seamless glass-lined steel tank construction.

B. Powered Anodes.

2.4 BURNER

A. A spiral-shaped heat exchanger placed entirely inside the tank which shall be glass-lined on the flue gas side to protect against acidic flue gas condensate.

B. Heater shall have a down-fired power burner designed for precise mixing of air and gas for

optimum efficiency, requiring no special calibration on start-up.

2.5 INSULATION

A. Insulate the water heater with factory applied foam insulation and trim with a heavy-gauge, enameled steel jacket.

2.6 CONTROLS

A. Furnish 120V controls for heaters of 100,000 BTUH and above. Controls shall be an integrated solid-state temperature and ignition control device with integral diagnostics, LED fault display capability, and a digital display of temperature system.

2.7 FLUE

A. This water heater(s) shall be suitable for sealed combustion direct-venting with 4” diameter Polypropylene Pipe (UL 1738) air intake pipe and 4” diameter Polypropylene Pipe (UL 1738 exhaust pipe for a total of 70 feet of intake and 70 feet of exhaust. Provide a properly sized thermal expansion tank as scheduled on drawings. Refer to manufacturer’s installation instructions for material types used in air intake and exhaust pipe use.

2.8 CARBON MONOXIDE MONITORING SYSTEM

A. Provide and install a manual reset Carbon Monoxide Detector located within the boiler room when combustion air is ducted to boilers. The Carbon Monoxide Detector and the boilers shall be interlocked so that the burners will not operate when the level of CO in the room rises above 50ppm. The Carbon Monoxide detector shall disable the boiler’s burner upon loss of power to the detector.

B. Carbon Monoxide Sensor with two year warranty by U.S. Draft Co. Model CGM-605 with model XB expansion module.
1. Provided with pre-programmed dry contacts to shut down equipment during unsafe operation.
2. NEMA 1 Enclosure
3. Complies with Texas State Boiler Code 65.603-2015
4. Additional features shall include 0-10 VDC control signal out, visual alarm and audible alarm.
5. Provide expansion board for additional equipment interlocks.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install a line size valve in the cold water supply close to each heater and a line size plug cock in the gas supply close to each heater.

B. Provide approved dielectric couplings at all cold water and hot water connections to storage tank, and at pressure and temperature relief valve connection.

C. Install according to manufacturer's specifications and pipe as shown.

D. Install water heater in galvanized drain pan piped to floor drain. Provide ¾” outlet connection. Elevate water heater tank bottom above drain pan as to not allow standing water inside of drain pan to touch bottom of tank.

E. Provide and install acid neutralization box for each heater on condensate from exhaust vent.

3.2 STARTUP

A. Startup shall be performed by factory trained and authorized personnel. The factory representative shall also provide a technical and practical operation and maintenance training seminar including a hands-on operation and maintenance demonstration, and classroom presentation with handouts and visual aids, for no less than three physical plant personnel.

B. Startup procedure shall include a functional test of Carbon Monoxide Detector. Simulate an alarm condition and demonstrate the functionality of the detector shutting down the appliances. Owner / Engineer shall be present to witness test.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES AND FIXTURE CARRIERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install water closets, urinals, lavatories, electric drinking fountains, fixture carriers and plumbing appurtenances.

1.2 RELATED WORK

A. Division 22 Plumbing
1. Drains, Hydrants and Cleanouts.
2. Domestic Water Piping.
3. Soil, Waste and Sanitary Drain Piping and Vent Piping.

1.3 JOB REQUIREMENTS

A. Furnish plumbing fixtures and trim as shown and specified. Provide faucets, fittings, supply stops and similar devices of a single manufacturer. Furnish faucets and supply stops with renewable seats. Porcelain to steel and enameled cast iron fixtures shall be acid resistant. Wall hung fixtures shall be installed with a fixture carrier.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Plumbing Fixtures (Vitreous China):
1. American Standard.
2. Eljer
3. Toto
4. Crane

B. Plumbing Faucets:
1. Chicago.
2. T&S Brass.

C. Supports and Carriers:
1. Wade
2. Zurn
3. J.R. Smith.
4. Josam.
5. Watts

D. Flush Valves:
1. Sloan
2. Zurn
3. Toto

E. Supplies, Stops and Chrome Plated Tubular Brass:
1. McGuire
2. Chicago
3. Zurn

F. Water Closet Seats:
1. Beneke
2. Church
3. Olsonite
4. Bemis
5. Centoco

G. Electric Drinking Fountains:
   1. Halsey Taylor
   2. Elkay

H. Floor Drains:
   1. J.R. Smith
   2. Josam
   3. Zurn
   4. MIFAB

I. Cleanouts:
   1. J.R. Smith
   2. Josam
   3. Zurn
   4. MIFAB

J. Shower Valves
   1. Symmons
   2. Bradley

K. Stainless Steel Sinks:
   1. Elkay
   2. Just

L. Mop Sinks:
   1. Crane Fiat
   2. Stern Williams
   3. Acorn

M. Roof Drains:
   1. J.R. Smith
   2. Josam
   3. Zurn
   4. MIFAB

N. Thermostatic Mixing Valves
   1. Lawler
   2. Symmons
   3. Leonard

O. Emergency Safety Equipment
   1. Bradley

P. Shock Arrestors: (Piston Type)
   1. Precision Products
   2. Sioux Chief

Q. Backflow Preventors
   1. Watts
   2. Wilkins

R. Hose Bibbs
   1. Chicago
   2. T&B Brass

S. Wall Hydrants
   1. Wade
   2. Zurn
   3. Josam

W. Solids Interceptors
1. Wade
2. Josam

2.2 REQUIREMENTS

A. Refer to the drawings for equipment to be supplied.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the manufacturer's instructions.

B. Make rough-in and final connection of service to each fixture provided under this Section and other Sections or Architectural or Plumbing Drawings.

C. Provide necessary stops, valves, traps, unions, vents, cold water, hot water, sanitary, etc. for a complete installation.

D. Provide isolation valves in domestic water lines to isolate all equipment, restrooms, hose bibbs, and where shown on drawings.

E. Remove piping and services roughed-in incorrectly and install correctly, without cost.

F. Exposed piping, fittings and appurtenances shall be chrome-plated brass.

G. Coordinate with the Contractor for locations and service required for each plumbing fixture.

H. All floor drains and floor sinks shall have trap primer connections. Provide trap primer valves and 1/2-inch water line to each floor drain connection. Trap primer supply line shall have ball valve and Y strainer on inlet side of trap primer valve to facilitate cleaning.

I. All floor drains and floor sink locations are to be coordinated with all equipment. Locate drains in mechanical equipment spaces to conform to drain locations of equipment furnished. Coordinate drain location with food service equipment and Architectural Drawings.

J. All floor drains, floor sinks and cleanout covers are to be provided with stainless steel vandal resistant screws.

K. Trap primer valves installed in concealed spaces shall have approved access doors for accessibility.

END OF SECTION

SECTION 22 63 11

GAS PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install steel gas pipe inside buildings, including the supply line from the meter, service lines to gas equipment and appliances, termination of the service line with a plug valve, drip leg, and final connection to equipment and appliances with unions.

B. Coordinate service line from utility main and extend to meter. Coordinate installation of the service line and meter with Gas Company.

C. Extend steel gas piping from meter to inside the building to all fixtures, appliances and equipment requiring gas.

1.2 RELATED WORK

A. Division 22 Plumbing
   1. Plumbing Pipe and Fittings
   2. Valves and Vents

1.3 UTILITY CONNECTIONS

A. Make arrangements for and pay all fees and connection charges for obtaining service to the building.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS - ABOVE GRADE

A. Pipe 2 inch and Smaller:
   1. Schedule 40 ASTM A 53 black steel pipe
   2. Factory fabricated socket weld fittings.

B. Pipe Larger than 2 inch:
   1. Schedule 40 ASTM A 53 black steel pipe.
   2. Factory fabricated butt weld fittings for welded steel pipes shall conform to ASTM A-234 WPB (seamless weld fittings).

C. Unions:
   1. Standard 150 lb. (300 lb. water, oil or gas) malleable iron.
   2. Ground joint unions, with bronze seat.
   3. Flange joints for pipe larger than 2 inch in diameter.

D. Flanges:
   1. Steel flanges. ANSI B16.5 and ASTM A-105.

2.2 PIPE AND FITTINGS - BELOW GRADE OUTSIDE BUILDING

A. Polyethylene pipe shall be ASTM D3350 Grade PE24 cell classification and ASTM D1248 Class B material classification.

B. Pipe shall be medium density polyethylene PE 2406 and PE 2708 manufactured by Poly Pipe

Industries, Inc. or Performance Pipe.

C. Polyethylene yellow molded butt fittings for use with medium density polyethylene pipe shall meet testing requirements of ASTM D2513 and resin material listing of ASTM D3350 with PPI designation of PE 2406 as manufactured by Central Plastics Co.

2.3 VALVES

A. See Section 22 05 23.

2.4 GAS PRESSURE REGULATOR

A. Size the gas pressure regulator in accordance with the manufacturer's recommendations for flow quantities and reduced pressure as required for all equipment. Coordinate final equipment gas pressure requirements prior to ordering regulators. Provide American Meter Company regulators or approved equal, suitable for outdoor installation. Regulators outside exposed to weather shall be installed with vent in vertical down position.

B. All line pressure regulators shall be listed in accordance with ANSI (American National Standard) Z21.80 and CSA (Canadian Standards Association Standard) 6.22.

C. Where a line pressure regulator has an inlet pressure over 2 psi and serves an appliance rated for ½ psi (14” of water column) or less, a downstream overpressure devices (OPD must be installed in accordance with ANZI Z21.80.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation Standards: Install gas piping in accordance with recommendations of the National Fire Protection Association.

B. Drip Legs: Install a capped drip leg 6 inches long at the base of each vertical rise.

C. Coating and Wrapping. Coat and wrap underground piping in accordance with the service utility company standards.

D. Sleeves.
1. Encase gas piping running in or through solid partitions with thin wall metal conduit. Sleeve piping and fittings shall be two pipe sizes, but not less than 1 inch larger than encased gas piping.
2. Encase gas piping running below slab in Schedule 40 PVC, minimum size two pipe sizes larger than gas pipe. Vent sleeve to atmosphere with a 1-1/2 inch vent with 1-1/2 inch return bend above building roof. Seal ends of sleeve with UL fire rated caulk.

E. Do not install gas piping exposed to view inside public area, or occupied spaces, without prior written approval.

F. Weld all gas piping above grade.

G. Provide test ports and isolation valves to enable proper testing of system in the future.

H. Provide isolation valve and unions across regulators for proper removal.

I. Provide transition risers where below grade polyethylene pipe changes to steel pipe above grade.

J. Gas Pressure Regulators / Vents:
1. Piping shall be sized in accordance with the regulator manufacturer's instructions. Never use pipe sizes smaller than the vent size; smaller pipe sizes restrict the gas flow. Where there is more than one regulator at a location, each regulator shall have a separate vent to the roof / outdoors. Headers with various installed devices can cause regulator malfunction.
2. Support the vent pipe to eliminate strain on the regulator diaphragm case.
3. Install vent piping from regulators to location to prevent gas smells from entering building. Do not locate the vent line terminus near windows, fans, or other ventilation equipment. See the installation instructions furnished with the regulator.
4. Install double elbows and insect screen at end of piping to prevent moisture and insects from entering. Always point outdoor vent pipes in the downward position to reduce the possibility of rain, snow, sleet, and other moisture entering the pipe.
5. When installed inside building route vents horizontally and terminate through building sidewall. The vent must be piped to the outside atmosphere using the shortest length of pipe, the fewest possible pipe elbows, and a pipe diameter as large as the vent size or larger. If a long gas run must be used, increase the pipe one nominal size every ten feet to keep the flow restriction as low as possible. Vents terminating through roof must have prior approval from Architect before installation. Through roof penetrations shall be minimized.
6. Regulators installed outside or on roof top: Install regulator vent turned downward with insect screen over vent opening. The vent shall be designed to prevent the entry of water, insects, or other foreign materials that could cause blockage.
7. Ensure the end of the vent line is away from ANY potential ignition sources. It is the installer's responsibility to ensure the vent line is exhausting to a safe environment
8. Adhere to all applicable codes and regulations.

3.2 TESTING GAS PIPING

A. Preliminary gas test as required by Code, but minimum test pressure of 50 PSI held for not less than eight hours without noticeable drop.

B. Test joints with a soap solution while lines are under pressure.

C. Repair leaks.

D. Final gas test shall be with a 24 inch column of mercury or a diaphragm gauge with a minimum dial size of 3-1/2 inches with a set hand and a pressure range not to exceed twenty (20) psig with 2/10-pound increments. The minimum test pressure shall not be less than ten (10) psi and the maximum test pressure shall not exceed twelve (12) psig. This test will be observed for no less than (30) thirty minutes with no drop in pressure.

E. Provide copy of gas pressure test reports in Operations & Maintenance Manual.

F. Provide Railroad Commission of Texas Pipeline Safety Form PS-86B.
1. To find form online, go to: Texas School Gas Test Form

3.3 IDENTIFICATION CONDUCTOR

A. Spiral A #12 AWG insulated copper conductor the full length of the thermoplastic piping system. Fasten to the pipe at 3 foot intervals with plastic tie wraps.

B. Terminate at each end in a 12 inch x 12 inch x 4 inch FRP junction box.
1. Bolted gasketed cover with stainless steel screws.
2. Screw type terminal strip.
3. Legend on cover "gas pipe identification conductor."

C. Set in concrete pad.

3.4 PAINT EXPOSED OUTSIDE GAS PIPE

A. Interior and Exterior Gas piping shall be protected from rust.

B. Paint pipe with a flat alkyd coating, clean pipe prior to painting by preparing surface by hand tool cleaning per SSPC-SP2-82, applying one coat of Glidden Y-590 Rustmaster Metal Primer White and top coat of Yellow Alkyd Flat Enamel.

END OF SECTION

SECTION 23 01 00

HVAC OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Compilation product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare operating and maintenance data as specified.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit three copies of complete manual in final form.

1.2 SUBMITTALS

A. Thirty (30) days after the Contractor has received the final scheduled identified submittals bearing the Architect/Engineer's stamp of acceptance (including resubmittals), submit for review one copy of the first draft of the Operating and Maintenance Manual. This copy shall contain as a minimum:
1. Table of Contents for each element.
2. Contractor information.
3. All submittals, coordination drawings and product data, reviewed by the Architect/Engineer; bearing the Architect/Engineer's stamp of acceptance. (When submittals are returned from Engineer "Correct as Noted", corrected inserts shall be included.)
4. All parts and maintenance manuals for items of equipment.
5. Warranties (without starting dates)
6. Certifications that have been completed. Submit forms and outlines of certifications that have not been completed.
7. Operating and maintenance procedures.
8. Form of Owner's Training Program Syllabus (including times and dates).
9. Control operations/equipment wiring diagrams.
10. Schedule of filters for each item of equipment.
11. Schedule of belts for each item of equipment.
11. Equipment startup reports.
12. Other required operating and maintenance information that are complete.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit completed manuals in final electronic form to the Architect/Engineer one day after substantial completion, and prior to Owner's instructions. Include all specified data, test and balance reports, drawings, dated warranties, certificates, reports, along with other materials and information.

D. The Architect/Engineer will review the manuals for completeness within fifteen (15) days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Architect / Engineer. The manuals will not be retransmitted.

F. Electronic copies of complete Manuals will be delivered to the Owner.

PART 2 - PRODUCTS

2.1 BINDERS

A. Commercial quality black three-ring binders with clear overlay plastic covers.

B. Minimum ring size: 1".
Maximum ring size: 3".

C. When multiple binders are used, correlate the data into related groupings.

D. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals:
1. Prepare data in form of an instructional manual for use by Owner's personnel.
2. Format:
a. Size: 8-1/2" x 11".
b. Text: Manufacturer's printed data or neatly typewritten.
3. Drawings:
a. Provide reinforced punched binder tab and bind in text.
b. Fold larger drawings to size of text pages.
4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
a. Title of Project
b. Identity of separate structures as applicable.
c. Identity of general subject matter covered in the manual.
6. Binder as specified.

B. Content of Manual:
1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
a. Contractor, name of responsible principal, address and telephone number.
b. A list of each product required to be included, indexed to content of the volume.
c. List with each product, name, address and telephone number of:
1) Subcontractor or installer.
2) Maintenance contractor as appropriate.
3) Identify area of responsibility of each.
4) Local source of supply for parts and replacement.
d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
a. Include those sheets pertinent to the specific product.
b. Annotate each sheet to:
1) Identify specific product or part installed.
2) Identify data applicable to installation.
3) Delete references to inapplicable information. (All options not supplied with equipment shall be marked out indicated in some manner.
3. Drawings:
a. Supplement product data with drawings as necessary to illustrate:
1) Relations of component parts of equipment and systems.
2) Control and flow diagrams.
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
c. Do not use Project Record Documents as maintenance drawings.
4. Written text, as required to supplement product data for the particular installation:
a. Organize in consistent format under separate headings for different procedures.
b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued.
a. Provide information sheet for Owner's personnel, giving:
1) Proper procedures in event of failure.
2) Instances that might affect validity of warranties or bonds.
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems.
1. Content for each unit of equipment and system as appropriate:
a. Description of unit and component parts.

1) Function, normal operating characteristics, and limiting conditions.
2) Performance curves, engineering data and tests.
3) Complete nomenclature and commercial number of replaceable parts.

b. Operating procedures:
1) Start up, break-in, routine and normal operating instructions.
2) Regulation, control, stopping, shut down and emergency instructions.
3) Summer and winter operating instructions.
4) Special operating instructions.

c. Maintenance procedures:
1) Routine operations
2) Guide to trouble-shooting.
3) Disassembly, repair and reassembly.
4) Alignment, adjusting and checking.
5) Routine service based on operating hours.

d. Servicing and lubrication schedule. List of lubricants required.
e. Manufacturer's printed operating and maintenance instructions.
f. Description of sequence of operation by control manufacturer.
g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
1) Predicted life of part subject to wear.
2) Items recommended to be stocked as spare parts.
h. As installed control diagrams by controls manufacturer.
i. Complete equipment internal wiring diagrams.
j. Schedule of filters for each air handling system.
k. Schedule of belts for each item of equipment.
l. Each Contractor's coordination drawings.
m. As installed color coded piping diagrams.
n. Charts of valve tag number, with location and function of each valve.
o. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
p. Other data as required under pertinent sections of the specifications.

2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications.
4. Provide complete information for products specified in Division 23.
5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.
8. Provide training report and certificates.
9. Provide extended compressor warranty certificates.

END OF SECTION

SECTION 23 05 00

MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of the General Requirements, and other provisions and requirements of the contract documents apply to work of Division 23 Mechanical.

B. Applicable provisions of this section apply to all sections of Division 23, Mechanical.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Mechanical work shall comply with applicable inspection services:
1. Underwriters Laboratories
2. National Fire Protection Association
3. State Health Department
4. Local Municipal Building Inspection Department
5. Texas Department of Licensing & Regulations (ADA)

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A specialist in this field and have the personnel, experience, training, skill, and organization to provide a practical working system
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that has served their Owners satisfactorily for not less than 3 years

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where specified capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified capacities.

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which

actual construction is at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various lines, valves, ductwork, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record existing and new underground and under slab piping with dimensioned locations and elevations of such piping.

B. At the conclusion of project, obtain without cost to the Owner, erasable mylars of the original drawings and transfer as-built changes to these. Prior to transmittal of corrected drawings, obtain 3 sets of blue-line prints of each drawing, regardless of whether corrections were necessary and include in the transmittal (2 sets are for the Owner's use and one set is for the Architect/Engineer's records). Delivery of these as-built prints and reproducibles is a condition of final acceptance. Provide record drawings on one set each (reproducible Dayrex mylar film positives) and AutoCad 2014 / Revit CAD files on disk (CD Rom).

C. As-Built drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
2. Remove Engineer’s seal, name, address and logo from drawings.
3. Mark documents RECORD DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY
5. Indicate all changes to construction during construction. Indicate actual routing of all piping, ductwork, etc. that were deviated from construction drawings.
6. Indicate exact location of all underground mechanical piping and elevation.
7. Indicate exact location of all underground electrical raceways and elevations.
8. Correct schedules to reflect (actual) equipment furnished and manufacturer.
9. Location and size of all ductwork and mechanical piping above ceiling including exact location of isolation of domestic and mechanical valves.
10. Exact location of all electrical equipment in and outside of the building.
11. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
12. Cloud all changes.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under that Division. Determine from the Contractor for the various trades, the Owner, and by direction from the Architect/Engineer, the exact location of all items.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the work is understood to mean hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is understood to mean open to view.

1.10 GUARANTEE

A. Guarantee work for 1 year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional cost. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer will be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before bid due date. Submit complete design and performance data to the Engineer.

1.14 OPERATING TESTS

A. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect/Engineer. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.15 WARRANTIES

A. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.16 BUILDING CONSTRUCTION

A. It shall be the responsibility of each sub-contractor to consult the Architectural and Engineering drawings, details, and specifications and thoroughly familiarize himself with the project and all job related requirements. Each sub-contractor shall cooperate with the General Contractor to verify that all piping and other items are placed in the walls, furred spaces, chases, etc., so there will be no delays in the job.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 OPENINGS

A. Framed, cast or masonry openings for ductwork, equipment or piping are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.2 AIR FILTERS AND PIPE STRAINERS

A. Immediately prior to substantial completion of the project, inspect, clean and service air filters and strainers. Replace air filters.

3.3 LUBRICATION, REFRIGERANT AND OIL

A. Provide a complete charge of correct lubricant for each item of equipment requiring lubrication.

B. Provide a complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced conditions, check the charge and modify for proper operation as required.

C. Provide a complete charge of special oil for refrigeration use, suitable for operation with refrigerant, in each system.

3.4 HOUSEKEEPING PADS

A. Provide equipment housekeeping pads under all floor mounted and ground mounted HVAC equipment, and as shown on the drawings.

B. Concrete work as specified in Division 3.

C. Concrete pads:
1. 4" high, rounded edges, minimum 2500 psi unless otherwise indicated on the drawings
2. Chamfer strips at edges and corner of forms.
3. Smooth steel trowel finish.
4. Doweled to existing slab

D. Install concrete curbs around duct penetrations or multiple pipe penetrations.

3.5 TRAINING AND INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection, conduct an on-site training program to instruct the Owner's operating personnel in the operation and maintenance of the mechanical systems.
1. Provide the training during the Owner's regular working day.
2. The Instructors shall each be experienced in their phase of operation and maintenance of building mechanical systems and with the project.

B. Time to be allocated for instructions.
1. Minimum of 4 hours dedicated instructor time for 2 people. 8 hours total.

C. Before proceeding with the on-site training program, submit the program syllabus; proposed time and dates; and other pertinent information for review and approval.
1. One copy to the Owner.
2. One copy to the Architect/Engineer.

D. The Owner will provide a list of personnel to receive instructions, and will coordinate their attendance at the agreed upon times.

E. Use the operation and maintenance manuals as the basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance. Operation and Maintenance manuals shall be provided prior to training and instruction.

F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of the training program that instructions have been satisfactorily completed. Give time and date of each demonstration and hours devoted to the demonstration, with a list of people present.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

L. Training and demonstration shall be video recorded. Copies of the videos shall be provided to the owner upon completion.

3.6 EQUIPMENT IDENTIFICATION

A. Provide a laminated engraved plastic nameplate on each piece of equipment and starter.
1. Designation approved by Architect/Engineer.
2. Equipment includes, but is not limited to, air handling units, fan coil units, variable volume boxes, fans, pumps, boilers and chillers.
3. Submit schedule of equipment to be included and designations.

B. Provide nameplates with 1/2" high letters and fastened with epoxy or screws.

3.7 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.8 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

3.9 INDOOR AIR QUALITY

A. All equipment and ductwork shall be installed to allow sufficient space for testing, maintenance, and commissioning functions. Access doors or panels shall be installed in ventilation equipment, ductwork, and plenum enclosures for inspection and cleaning of outdoor air intakes, mixing plenums, up and downstream of coils, filters, drain pans and fans.

B. Practice source control and eliminate potential contaminants in material selection, installation, and maintenance.

C. Provide installation and disposal instructions for all materials and chemicals that are potential contaminants.

D. Obtain and conform to the requirements of the Material Safety Data Sheets (MSDSs) in the use of materials.

E. Utilize manufacturer’s recommendations and provide installation instructions for all chemicals, compounds, and potential contaminants including pre-installation degassing if required.

F. Ventilate completed building prior to final completion using no less than design outside air for at least 48 hours before occupancy.

G. Make provisions for controls to prevent the entry of air contaminants into the HVAC air distribution system.

H. Steps shall be taken to ensure that the HVAC system continues to function effectively and are not damaged or contaminated during construction activities.

END OF SECTION

SECTION 23 05 10

HVAC CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions, mock-ups and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples. All exposed finishes shall be approved by the Architect. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide qualified personnel to observe:
1. Field conditions.
2. Condition of installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Testing, adjusting, and balancing of equipment.

B. Representative shall make written report of observations and recommendations to Architect / Engineer.

1.7 MOCK-UPS

A. Assemble and erect the specified equipment and products complete, with specified anchorage and support devices, seals and finishes.

B. Do not proceed with any work involving a mock-up, until the related mock-up has been approved in writing.

C. Acceptable mock-ups in place shall be retained in the completed work.

D. Perform tests and submit results as specified.

1.8 SCHEDULING OF MOCK-UPS

A. Schedule demonstration and observation of mock-ups, in phases, with Architect / Engineer.
1. Rough-in.
2. Finish with all appurtenances in place.
3. Insulation installed.
4. Demonstrations.

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS.

PART 3 - EXECUTION

3.1 HOT AND CHILLED WATER CIRCULATING PUMPS

A. Mock-up one each system pump, completely installed including:
1. Pump mounted on housekeeping pad.
2. Piping to a point beyond the complete valve and instrumentation assemblies.
3. Strainers with blowdown.
4. Flexible piping connection.
5. Pipe supports.
5. Pipe insulation.
7. Pump painting.
8. Electrical connections.

3.2 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to the project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather will be rejected, and the Contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

B. Adequately protect equipment from damage after delivery to the project. Cover with heavy tarpaulins, drop cloths or other protective coverings as required to protect from plaster, paint, mortar and/or dirt. Do not cover with plastic materials and trap condensate and cause corrosion.

C. All areas accessed during construction shall be kept broom clean prior throughout construction and prior to starting any equipment to minimize equipment being exposed to dust.

END OF SECTION

SECTION 23 05 11

MECHANICAL ALTERATIONS PROJECT PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Inspect and service existing equipment and materials that are to remain or to be reused.

B. Disposal of equipment, materials, or housekeeping pads to be abandoned. Prior to disposal, the Contractor shall verify with the Owner what is to be salvaged by the Owner and what is to become the property of the Contractor.

C. Handling of equipment and materials to be removed.

1.2 QUALITY ASSURANCE

A. Coordination with the Owner prior to the disconnection or shutdown of existing equipment, or to the modification of existing operational systems.

1.3 CONTRACT DRAWINGS

A. There is the possibility that existing conditions and devices are affected by the work indicated on the drawings and called for in the specifications (project manual) which do not appear on the drawings. It is the Contractor’s responsibility to visit the site and determine all of the existing conditions and to consider these existing conditions when making and presenting a proposal, to have a complete proposal.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Material used to upgrade and repair existing equipment shall conform to that specified.

B. Material used to upgrade and repair existing equipment shall not void existing warranties or listings of the equipment to be upgraded or repaired.

C. Material used to upgrade and repair existing equipment shall be new and shall be of the same manufacturer of the existing equipment, shall be acquired through the existing original equipment manufacturer’s approved distribution channels, shall have manufacturer’s warranties for the new material being used, and shall be listed for the use intended.

PART 3 - EXECUTION

3.1 INSPECTION

A. Existing materials and equipment indicated on the drawings or in the specifications to be reused shall be inspected for damaged or missing parts. Contractor shall notify the Architect/Engineer, in writing, accordingly.

B. If using materials specified or shown on the drawing voids or diminishes the warranty or operation of remaining equipment or systems, the Contractor shall notify the Architect/Engineer, in writing.

C. Verify field measurements, above and underground piping connections and flows.

D. Demolition Drawings are based on casual field observation, and when available, existing record documents. Report discrepancies to Architect before disturbing existing installation, and immediately after such discrepancies are discovered.

E. Field verify existing conditions and actual utility uses prior to final connections. Existing drawings may not have been available for all required information. Use pipe inspection camera system to

field verify existing sanitary / grease waste connections. Verify actual HVAC supply and return piping connections. Verify flow direction and depth prior to connection to existing plumbing systems.

3.2 APPLICATION

A. Existing materials and equipment indicated on the drawings or in the specifications to be reused shall be cleaned and reconditioned, including cleaning of piping systems and HVAC coils prior to installation and reuse.

B. Material and equipment removed that is not to be salvaged for Owner's use or for reuse on the project shall become the property of the Contractor and be removed from the site.

C. Material or equipment salvaged for Owner's use shall be carefully handled and stored where directed by the Owner or the Architect / Engineer. Relocate material and / or equipment as directed by Owner.

D. Materials and equipment not indicated to be removed or abandoned shall be reconnected to the new system.

E. Materials, equipment and housekeeping pads not to be reused or reconnected shall be removed for Owner’s review and salvaged by Contractor.

F. Prior to start of construction, Contractor shall walk areas to be renovated with Owner to identify and document items to be salvaged for Owner’s use.

G. Clean and repair existing materials and equipment that remain or are to be reused.

H. Contractor shall utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

3.3 SEQUENCE AND SCHEDULE

A. Coordinate utility service outages with Utility Company, Architect and Owner.

B. Provide additional or temporary valves, piping, ductwork and connections to maintain existing systems in service during construction.

C. Existing HVAC and Plumbing Service: Refer to drawings for work in remodeled areas. Where facilities in these areas are to remain in service, any related work to keep the facilities in operation is specified in this Division. Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. Maintain acceptable temperature and humidity control within existing building during renovation activities.

D. Remove and replace existing Mechanical systems and appurtenances as occasioned by new or remodeled construction. Re-establish service that may be interrupted by remodeled construction.

E. Refer to other drawings series for work in remodeled areas. Where facilities in these areas are required to remain in service, any related work required to keep these facilities in operation is specified in this Division.

F. Remove and replace existing piping, grilles, boxes and ductwork coincident with the construction.

G. Remove or relocate existing piping, grilles, ductwork or housekeeping pads as occasioned by new or remodeled construction. Cap unused HVAC or domestic piping and duct beyond the new finish line.

H. Relocate all HVAC and or domestic piping, grilles, boxes and ductwork as required to accommodate new work requiring precedence.

I. Remove concrete housekeeping pad where materials or equipment have been removed.

J. Remove all known utilities, which do not provide service to the buildings that remain.

K. Remove existing plumbing or mechanical vent penetrations through roof not to be reused.

3.4 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner's representative unless they are not wanted, then it will be the responsibility of this Contractor to remove such items and properly dispose of them. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon approval of the Owner's representative substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean, repair, and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore them to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner's representative to such items and receive further instructions before removal. Items damaged in repositioning operations are the contractor's responsibility and shall be repaired or replaced by the contractor as approved by the owner's representative, at no additional cost to the Owner.

D. HVAC, Plumbing, piping, ductwork and appurtenances to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner's representative. Piping and ductwork not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Construction Inspector. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities that must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner's representative hereinbefore specified.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to mechanical installations that remain active. Modify installation or provide access panel as appropriate.

G. Extend existing installations using materials and methods compatible with existing mechanical installations, or as specified.

H. Existing mechanical piping and devices found to need additional hangers installed should be added at no additional cost to the Owner.

3.5 PROTECTION OF THE WORK

A. Provide adequate temporary support and auxiliary structure as necessary to ensure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of work from damage.

C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

3.6 IDENTIFICATION OF EQUIPMENT IN RENOVATED AREAS

A. Identification of Equipment: Provide new identification of all existing equipment to be reused and located within the renovated areas. Do not include the description “existing”. Provide new nameplates for all existing mechanical equipment in renovated areas as specified in Section 23 05 00 Mechanical General Provisions.

3.7 REFRIGERANT DISPOSAL

A. Contractor shall dispose of refrigerant from all DX equipment including refrigerant piping per OSHA, EPA, Federal, State and Local Codes.

END OF SECTION

SECTION 23 05 12

HVAC SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by these specifications as outlined below.

B. The term submittal, as used herein, refers to all:
1. Shop Drawings
2. Coordination Drawings
3. Product data

C. Submittals shall be prepared and produced for:
1. Distribution as specified
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relationship to adjacent features, critical features, work, or products.

D. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: ¼” = 1’-0”.

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each mechanical room and for each outside equipment pad where equipment is located, submit plan and elevation drawings. Show:
1. Actual mechanical equipment and components to be furnished
2. Service clearance
3. Relationship to other equipment and components
4. Roof drains and leader piping
5. Fire protection piping and equipment

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Related requirements:
1. Ductwork shop drawings
2. Coordination drawing specified in Division 26

F. Submit shop drawings in plan, elevation and sections, showing equipment in mechanical equipment areas.

G. Gas piping sketch indicating proposed location of piping prior to proceeding with the installation.

1.4 PRODUCT DATA AND INSTALLATION INSTRUCTION

A. Submit only pages which are pertinent to the project. All options which are indicated on the product data shall become part of the contract and shall be required whether specified are not.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: COMPLY, DO NOT COMPLY, or NOT APPLICABLE. Explain all DO NOT COMPLY statements.

F. Provide a separate transmittal for each submittal item. Transmittals shall indicate product by specification section name and number. Separate all submittals into appropriate specification section number. Do not combine specification sections.

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Manufacturer's catalog numbers
4. Conformance with requirements of Contract Documents

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect/Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect/Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
1. Proper sizes and capacities
2. That the item will fit in the available space in a manner that will allow proper service
3. Construction methods, materials and finishes

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
   1. Shop Drawings and Coordination Drawings: Submit one reproducible transparency and three opaque reproductions.
   2. Product Data: Submit the number of copies which the contractor requires, plus those which will be retained by the Architect/Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name, address and contact number.
   4. The number of each Shop Drawing, Project Datum and Sample submitted
   5. Other pertinent data

D. Submittals shall include:
   1. The date of submission
   2. The project title and number
   3. Contract Identification
   4. The names of:
      a. Contractor
      b. Subcontractor
      c. Supplier
      d. Manufacturer
   5. Identification of the product
   6. Field dimensions, clearly identified as such
   7. Relation to adjacent or critical features of the work or materials
   8. Applicable standards, such as ASTM or federal specifications numbers
   9. Identification of deviations from contract documents
   10. Suitable blank space for General Contractor and Architect/Engineer stamps
   11. Contractor's signed and dated Stamp of Approval

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
   1. Finishes which involve Architect/Engineer selection of colors, textures or patterns
   2. Associated items which require correlation for efficient function or for installation

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number
   2. The exact specification section title

B. Submittals delivered to the Architect/Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make re-submittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a re-submittal
   2. Identify changes made since previous submittals

B. Indicate any changes which have been made, other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect/Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect/Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect/Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT / ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect / Engineer will:
1. Review identified submittals with reasonable promptness and in accordance with schedule
2. Affix stamp and initials or signature, and indicate requirements for re-submittal or approval of submittal
3. Return submittals to Contractor for distribution or for resubmission

B. Review and approval of submittals will not extend to design data reflected in submittals which is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review and approval is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Div. 1.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 23 05 13

ELECTRICAL PROVISIONS OF HVAC WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical provisions to be provided as mechanical work are indicated in other Division 23 sections, on drawings, and as specified.

B. Types of work, normally recognized as electrical but provided as mechanical, specified or partially specified in this Section, include but are not necessarily limited to the following:
1. Motors for mechanical equipment.
2. Starters for motors of mechanical equipment, but only where specifically indicated to be furnished integrally with equipment.
3. Wiring from motors to disconnect switches or junction boxes for motors of mechanical equipment, but only where specifically indicated to be furnished integrally with equipment.
4. Wiring of field-mounted float control switches, flow control switches, and similar mechanical-electrical devices provided for mechanical systems, to equipment control panels.
5. Wiring of smoke detectors for shutdown of air handling equipment when a fire alarm system is not included in the project.
6. Wiring of oil pump, vibration and oil level limit switches for cooling towers.
7. Refrigerant monitor/sensor/alarming and field installed visual/audible display alarms.
8. Pipe heat tracing.
9. Cooling tower vibration switch/interlock/reset.
10. Field interlock wiring from chiller: flow switches, pump aux. Contacts, pump start/stop.
11. Power supply 120 VAC and control signal from chiller control panel to condenser water flow control valve installed in piping leaving chiller.
12. Wiring of all related circulating water system chemical treatment devices.
    a. Low voltage electric contacting water meter
    b. Solenoid valve/blow-down assembly
13. Radiant heater timer switches and/or thermostats
14. Low Voltage thermostat wiring

C. Refer to Division 23 Controls Sections for related control system wiring.

D. Refer to Division 23 sections for specific individual mechanical equipment electrical requirements.

E. Refer to Division 26 sections for motor starters and controls not furnished integrally with mechanical equipment.

F. Refer to Division 26 sections for junction boxes and disconnect switches required for motors and other electrical units of mechanical equipment.

1.2 RELATED WORK

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to work of this Section.

1.3 QUALITY ASSURANCE

A. Wherever possible, match elements of electrical provisions of mechanical work with similar elements of electrical work specified in Division 26 sections for electrical work not otherwise specified.

B. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.4 SUBMITTALS

A. Include in listing of motors, voltage, notation of whether motor starter is furnished or installed integrally with motor or equipment containing motors.

PART 2 - PRODUCTS

2.1 MOTORS

A. Provide motors for mechanical equipment manufactured by one of the following:
1. Baldor Electric Company.
2. Century Electric Div., Inc.
3. General Electric Co.
4. Louis Allis Div.; Litton Industrial Products, Inc.
5. Lincoln Electric
6. Marathon Electric Mfg. Corp.
7. Reliance Electric Co.
8. Westinghouse Electric Corp.
9. WEG

B. Motor Characteristics. Except where more stringent requirements are indicated, and except where required items of mechanical equipment cannot be obtained with fully complying motors, comply with the following requirements for motors of mechanical work:

C. Temperature Rating. Rated for 40 Degrees C environment with maximum 50 Degrees C temperature rise for continuous duty at full load (Class A Insulation).

D. Provide each motor capable of making starts as frequently as indicated by automatic control system, and not less than 5 starts per hour for manually controlled motors.

E. Phases and Current Characteristics. Provide squirrel-cage induction polyphase motors for 3/4hp and larger, and provide capacitor-start single-phase motors for 1/2hp and smaller, except 1/6hp and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division 26 sections, and with individual equipment requirements specified in other Division 23 requirements. For 2-speed motors provide 2 separate windings on polyphase motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.

F. Service Factor. 1.15 for polyphase motors and 1.35 for single-phase motors.

G. Motor Construction. Provide general purpose, continuous duty motors, Design "B" except "C" where required for high starting torque.
1. Frames. NEMA #56.
2. Bearings are to be ball or roller bearings with inner and outer shaft seals, regreasable except permanently sealed where motor is inaccessible for regular maintenance. Where belt drives and other drives produce lateral or axial thrust in motor, provide bearings designed to resist thrust loading. Refer to individual section of Division 23 for fractional-hp light-duty motors where sleeve-type bearings are permitted.
3. Except as indicated, provide open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation, and provide guarded drip-proof motors where exposed to contact by employees or building occupants. Provide weather-protected Type I for outdoor use, Type II where not housed. Refer to individual sections of Division 23 for other enclosure requirements.
4. Provide built-in thermal overload protection and, where indicated, provide internal sensing device suitable for signaling and stopping motor at starter.
5. Noise Rating: Provide "Quiet" rating on motors.

H. All motors shall be premium efficiency.

I. Provide an inverter duty motor on all equipment that utilizes a variable frequency drive.

2.2 EQUIPMENT FABRICATION

A. Fabricate mechanical equipment for secure mounting of motors and other electrical items included in work. Provide either permanent alignment of motors with equipment, or adjustable mountings as applicable for belt drives, gear drives, special couplings and similar indirect coupling of equipment. Provide safe, secure, durable, and removable guards for motor drives. Arrange for lubrication and similar running-maintenance without removal of guards.

2.3 GENERAL REQUIREMENTS – SHAFT GROUNDING RINGS

A. All motors operated on variable frequency drives shall be equipped with a maintenance-free, conductive microfiber shaft grounding ring to meet NEMA MG-1, 3.4.4.4.3 requirements, with a minimum of two rows of circumferential microfibers to discharge damaging shaft voltages away from the bearings to ground. SGR's Service Life: Designed to last for service life of motor. Provide AEGIS SGR Conductive MicroFiber Shaft Grounding Ring, or approved equal.

B. Application Note: Motors up to 100 HP shall be provided with one shaft ground ring installed on either the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor with the exception of line contact bearings in the drive end of the machine. In this instance the line contact bearing must be electrically insulated and the AEGIS Bearing Protection Ring installed on the opposite drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Verify voltage with Electrical Plans.

END OF SECTION

SECTION 23 05 14

HVAC CONDENSATE DRAIN PIPING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide and install air conditioning condensate drains.

1.2 RELATED WORK

A. Division 23 - Mechanical
   1. Insulation
   2. Pumps
   3. Hydronic system appurtenances
   4. Equipment Drain Pans

PART 2 - PRODUCTS

2.1 PIPE MATERIAL

A. Type “L” copper with drainage pattern fittings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the system to facilitate easy removal.
   1. Use threaded plugged tee at each change of direction to permit cleaning.
   2. Install a cleanout every 50 feet of straight run piping
   3. Maintain a positive slope on all piping

B. Install a water seal trap leg based on the fan pressure.
   1. Size the length of the trap leg 1 inch larger than the actual system pressure.

C. Install traps and cleanout as shown in the drawing details.
   1. Confirm requirements with manufacturer's installation instructions

3.2 SIZE PIPE AS SHOWN ON DRAWINGS.

A. Do not install piping sized smaller than the unit drain connection size.

3.3 SECONDARY DRAINS

A. Provide secondary drains where required by code, shown on the drawings, or where equipment has secondary drain connections.

END OF SECTION

SECTION 23 05 17

HVAC ACCESS DOORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install access doors in wall or ceiling locations as required or shown for access to valves, controls, fire dampers, air distribution devices and other equipment requiring maintenance, adjustment or operation.

PART 2 - PRODUCTS

2.1 NON-FIRE RATED ACCESS DOORS

A. 16-Gauge frames

B. 14-gauge steel panels

C. Continuous fully concealed hinges

D. Flush screwdriver cam lock & cylinder lock for Owner selection

E. Automatic closing and latching mechanism

F. Prime coat finish

G. Brushed satin stainless steel finish for restroom, kitchen or cafeteria installation

H. Material suitable for wall and/or ceiling mounting

2.2 FIRE RATED ACCESS DOORS

A. UL listed, 1-1/2 hour Label “B”, access doors

B. 16-Gauge stainless steel

C. 20-Gauge insulated sandwich-type door panel.

D. Two inch thick with fire rated insulation

E. Continuous fully concealed hinge

F. Automatic closing and latching mechanism

G. Knurled knob and recessed key operation for Owner selection

H. Interior latch release slide for opening from inside

I. Prime coat finish

J. Material suitable for wall and/or ceiling mounting

2.3 ACCEPTABLE MANUFACTURERS

A. Milcor

B. MIFAB

C. Acudor

D. Elmdor

PART 3 - EXECUTION

3.1 INSTALLATION

A. Access doors specified in Division 23 will be installed by other crafts. Not all required access doors are shown. Coordinate with the Contractor to locate access doors for ease of operation and maintenance of concealed equipment.

B. Installation shall be in accordance with the manufacturer's printed instructions.

C. Minimum size required:
1. 36" x 24" for Mechanical HVAC equipment related items
2. 18" x 18" for electrical related items

END OF SECTION

SECTION 23 05 18

VARIABLE FREQUENCY INVERTER

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install a variable frequency inverter for the following equipment items.
   1. Variable Volume Air Handling Units.
   2. Pumps.

1.2 RELATED WORK

A. Division 23 Mechanical
   1. Electrical Provisions of Mechanical Work.
   2. Pumps
   3. Cooling Towers
   4. Building Management Control System Sequences

1.3 COOPERATION WITH OTHER TRADES

A. Coordinate this work with work under Division 26 Electrical to ensure that intended functions are achieved.

B. Coordinate the size of the variable frequency inverter with the equipment being served by the inverter. The rated current output amps are to be equal to or greater than motor rated full load amps.

1.4 SUBMITTALS

A. Submit manufacturer's information and shop drawings as specified.
   1. Complete technical details.
   2. Dimensions and manufacturer's installation manual.
   3. Schematic diagrams of the circuitry and field connections.
   4. Manufacturer's start-up manual.

1.5 STANDARDS

A. UL.

B. CSA.

C. ISO 9001

D. NEC.

E. FCC.

1.6 WARRANTY

A. The manufacturer shall provide a full parts and labor warranty for a period of five (5) years from substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. ABB

B. Danfoss Graham

2.2 CABINET

A. The inverter and all accessories shall be provided within a wall mounted UL Listed NEMA 1 enclosure in interior AHU mechanical rooms and in NEMA 12 enclosure with deadsides and removable hinged, gasketed doors with provisions for locking in all Plant locations. Cabinet shall be constructed of metal for reduction of radio frequency interference (RFI) and electromagnetic frequency interference.

2.3 INTERFERENCE WITH OTHER SYSTEMS

A. The inverter shall be designed and constructed to comply with IEEE Standard 519-1993 with respect to line noise and RFI generation. All units shall generate less than 3% total harmonic distortion back to the incoming power line at the point of common connection with sensitive equipment. A harmonic analysis shall be submitted with the approval drawings to verify compliance with the latest version of IEEE-519 voltage and current distortion limits as shown in Table 1.2 and 10.3 at the point of common coupling (PCC). The PCC shall be defined as the consumer-utility interface or primary side of the main distribution transformer.

B. Dual DC Bus filtered chokes (factory installed and wired in the drive enclosure) equivalent to 5% input line reactors shall be provided to minimize harmonics reflected onto the input line.
1. Shall not interfere with computer and other electronic systems in the building.
2. If not inherently protected, provide a suitable isolation transformer.
3. The system shall not produce spikes on the incoming line.

C. Any inverter that generates sufficient electrical line noise to interfere with the operation of sensitive building equipment shall be field modified or replaced by the inverter supplier at no additional cost to the Owner.

2.4 PROTECTIVE CIRCUITS

A. Provide the following protection:
1. Input line fuses or molded case circuit breaker rated at 100 AIC.
2. Input line noise suppression with MOV's (metal oxide varistors) and snubber circuits. MOV's shall be provided across incoming line terminals, AC input reactors, DC choke filters, and transistors to protect inverter from voltage surges and spikes.
3. Protection of solid state inverter devices by limiting output current to 110% of inverter rating, automatically prevent overcurrent trip due to momentary overload conditions.
4. Current limiting DC buss fuse between input and output sections of inventor.
5. Input overvoltage trip at 480 vac + 10% trip.
6. Input undervoltage at 480 vac – 10% trip
7. Instantaneous overcurrent protection of solid state inverter devices.
8. Individual overcurrent protection of solid state inverter devices.
9. Output overvoltage trip.
10. Loss of input phase, phase reversals, or blown fuse.
11. Thermal overload trip for overload protection of solid state devices.
12. Ground fault protection on start-up.
13. Output line to line short circuit protection.
14. Phase to phase short circuit or severe overload conditions of output.
15. Overload of motor.
16. Frequency stall.
17. DC buss high voltage.
18. Control function error.
19. Heatsink over temperature (Max. operating ambient: 122 degrees F)
20. Controller able to operate without a motor or any other equipment connected to the output (To facilitate startup and troubleshooting).
21. Capable of restarting into a rotating motor without component damage.
22. Shut down safely without component failure in the event of a sustained power loss, and will automatically return to normal operation, if start is "on" and power is restored.
23. Shut down safely without component failure in the event of a momentary power loss. Automatically return to normal operation if the start is "on", and normal power is restored. Capable of establishing speed control without shutdown or component failure.

24. Designed for input power contactor opening or closing while control is activated, without damage to the controller.
25. Automatically reset trip resulting from overcurrent, undervoltage, overvoltage, or over temperature, and automatically restart after removal, or correction of the faulty condition.
26. Provide status lights or digital display for indication of failure conditions, and form C relay provided for remote indication. Digital display or status lights to indicate power on, at speed, and drive enabled.
27. Operation and fault diagnostic function circuits shall be built into each inverter that provides information in determining the cause and source of a fault. Diagnostics to provide the following information:
    a. Operating mode at trip (Accel, Decel, Constant speed).
    b. Output current at trip.
    c. Output voltage at trip.
    d. Additional faults that occurred simultaneously of immediately before displayed tripped.

    Any drive requiring separate card to provide this information shall provide a diagnostic card for each drive.
28. DC link reactor.
29. Power correction factor of 0.95.
29. Input power disconnect, lockable type.
30. Input power disconnect switch / circuit breaker, with lockable type handle.

2.5 OPERATOR DEVICES

A. The following operator devices shall be door or remote mounted:
1. Digital keypad and LCD provided to perform all parameter adjustments, operation monitoring, and operation programming.
2. Power on indication light.
3. Flush mounted meters or digital display to indicate output voltage, output frequency, and output current, in percent of maximum 0 to 100%.
4. Manual/Off/Auto 3 position selector switch (hand-off-auto) and manual speed setting control to provide the following control sequences:
    a. In automatic mode, controller shall follow an external control signal and respond to remote start-stop contact.
    b. In manual (hand) mode, controller shall follow speed signal set via door mounted keypad and start/stop switch. Switching from “hand” to “auto” and vice versa shall require a single keystroke to a dedicated changeover key. Inverters requiring multiple keystrokes and/or reprogramming of internal parameters to accomplish changeovers are not acceptable.
    c. An integral "safety interlock" protection shutdown circuit shall be provided for interface with firestats, smoke detectors, high static pressure limit switches, vibration switches, etc.
5. Programmable lockout code to prevent unauthorized programming.
6. Critical frequency avoidance capability (up to 3 resonant points).

2.6 FIELD ADJUSTMENTS

A. The following shall be adjustable in the field:
1. Maximum Speed: 0 to 125% adjustable.
2. Minimum Speed: 0 to 100% adjustable.
3. Acceleration/deceleration rates: 0 to 3600 sec.
4. Instantaneous overcurrent trip: 50% to 2000%.
5. Volts/hertz ratio: Field adjustable to 16 patterns or set for automatic selection of proper V/F load profile to operate motor without overdriving or overloading.
6. Current limit circuit: 60 to 100%.
7. Carrier frequency: 6 to 16 KHZ.
8. Control interface: selectable to follow a 0-5 VDC, 0-10 VDC, 4-20 MA, either direct or indirect acting.
9. Control signal Bias: 0 to 80 HZ.
10. Control signal gain: 0 to 80 HZ.
11. Calibration of remote speed signal: 0 to 80 HZ.

2.7 ELECTRICAL CONSTANT SPEED BYPASS

A. Provide all components and circuitry necessary to provide manual bypass of the inverter. The bypass package shall be mounted in a cabinet common with the inverter and shall be constructed in such a manner that the inverter can be removed for repair while still operating the motor in the "bypass" mode. Manual bypass shall contain the following:
   1. Two contactors mechanically interlocked via a three position through the door selector switch to provide the following control:
      a. "Inverter" Mode connects the motor to the output of the inverter.
      b. "Bypass" Mode connects the motor to the input sine wave power. Transfer must occur with input disconnect open. Motor is protected via thermal overload.
      c. "Off" Mode disconnects motor from all input power.
   2. A molded case circuit breaker or fused disconnect switch with door interlocked handle (lock out type) that interrupts input power to both the bypass circuitry and the drive.
   3. An input contactor, interlocked with both the thermal motor overload and external safeties which disconnects power to the motor regardless of the mode of operation (either "inverter" or "bypass" mode).
   4. A thermal overload to provide protection of motor in the bypass mode.
   5. A safety interlock circuit that disconnects power to the motor (regardless of the mode of operation – “inverter” or “bypass”) in response to a signal from the thermal overload and/or external safety circuits.
   6. Line voltage to 24 volt DC power source, fused per NEC, shall provide power to all bypass control circuits.

2.8 SERIAL COMMUNICATIONS

A. The VFD shall have the capability of communicating with the EMS control system via an RS-485 serial port.

B. VFD shall be provided with protocol information specific to the selected EMS control manufacturer and shall be pre-configured at the factory to automatic communications, without the need for field programming.

C. Serial communications capabilities shall be included, but not limited to: run/stop control, speed set adjustment, proportional/integral or PID control adjustments, current limit and accel/decel time adjustments. The drive shall also have the capability of allowing the DDC system to monitor the following feedback signals: process variable, output speed/frequency, current, torque, power (KW), operating hours, kilowatt hours; relay outputs, and diagnostic warning and fault information.

D. The VFD shall allow the DDC system to control the drive’s digital and analog outputs and monitor all drive digital and analog inputs via the serial interface.

E. Provide BACnet interface card.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation as per manufacturer's recommendations and requirements.
   1. Inverter chassis is properly grounded.
   2. Line, Load, Control, and Fire/Safety wiring are installed in separate conduits.
   3. Both ends of conduit entering and leaving VFD into AHU cabinets and motors must be sealed air tight.

3.2 MANUFACTURER START-UP SERVICE

A. Factory trained personnel shall be provided for start-up assistance, minimum (1) day per unit.
   1. The manufacturer shall provide start-up commissioning of the VFD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents.

2. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system.
3. Adjustable devices, components, and assemblies to assure optimum performance.
4. Make final adjustments to the installed drive to assure proper operation of the fan system. Obtain performance requirements from installer of driven loads.
5. Assistance will be provided to the Owner (upon request) to determine the optimum capacitance for per factory correction and avoidance of potential resonance problems and will determine optimum line filter required.
6. A written report, duly signed by the technician detailing set points of adjustable devices, amperages recorded, and any other pertinent data. This information is to be included in the operation and maintenance manual.

B. Input DC voltage to dry motor windings when fan is not in operation at the following locations:
1. Cooling tower fan motor
2. Motors downstream of coils
3. Rooftop unit motors

3.3 DEMONSTRATION AND TRAINING

A. Provide system demonstration to personnel, Owner, and/or Owner's selected representatives.

B. Demonstrate operation of controllers in the automatic and manual modes.

C. Provide a minimum of two days of technical training for the owner's operating and technical staff. Schedule training with owner's authorized factory trained service representatives, during normal business hours and not less than 30 days prior to planned session.

D. Training may be consecutive or random, at Owner's option.

END OF SECTION

SECTION 23 05 19

HVAC PRESSURE AND TEMPERATURE INSTRUMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies gauges, thermometers, wells and/or pressure and temperature test stations to be installed as specified.

1.2 RELATED WORK

A. Division 23, Mechanical
1. 23 05 00 - Mechanical General Provisions
2. 23 20 00 - Pipe and Pipe Fittings, General
3. 23 05 23 - Valves, Strainers and Vents
4. 23 21 13 - Hot Water and Chilled Water Piping, Valves and Appurtenances

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - GAUGES AND THERMOMETERS

A. Trerice

B. Taylor

C. Marsh

D. Weksler

E. Marshalltown

F. Weiss

G. Miljoco

2.2 PRESSURE GAUGES

A. Case and Ring: 4" type 304 stainless steel; liquid filled case with stainless steel bayonet ring.

B. Dial: White aluminum with black markings

C. Window: Clear acrylic

D. Tube: Phosphor bronze and forged brass socket.

E. Gauge accuracy: +/- 1% over operating range.

F. For pulsating service, provide impulse dampers.

G. Without flange for pipe mounting.

H. With flange for wall mounting.

I. Weiss Model: LF44S-1B or equal.

2.3 THERMOMETER WELLS

A. Brass or type 300 stainless steel. Machined bar stock, 1-piece construction.

B. Where installed in insulated piping or vessels, provide with extension neck to match insulation

thickness.

C. Provide metal-to-metal contact with bulb chamber for maximum sensitivity.

D. Wells shall be sized to extend a minimum of 50% into pipe.

2.4 THERMOMETERS IN PIPING SYSTEMS OR VESSELS

A. Die cast aluminum case with baked epoxy finish.

B. Adjustable angle 9" scale length.

C. Clear acrylic window.

D. Brass stem, length to match well.

E. Red reading organic spirit filled-in magnifying glass column.

F. White background with black figures and markings.

G. Brass stems and union connections.

H Accuracy: +/- 1% of scale range.

I. Range:
1. Hot water lines: 30°F to 240°F.
2. Chilled water lines: 0°F to 100°F or 120°F

2.5 PRESSURE AND TEMPERATURE TEST STATIONS

A. "Test Station" fitting to receive either a temperature or pressure probe. Fitting shall be solid brass with two valve cores of Nordel.
1. Fitted with a color coded cap strap with gasket.
2. Acceptable Manufacturer: Peterson Equipment Company.
3. Provide with extension neck to match insulation thickness.

B. Provide to the Owner a fitted case with:
1. Two 0-100 psi pressure gauges as specified and adapters with 1/8" OD probe.
2. Four 5" stem pocket testing thermometers.
a. Two with range 25°F to 125°F for chilled water and condenser water.
b. Two with range 0°F to 220°F for hot water.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with drawing details and manufacturer's recommendations.

B. Provide a ball valve at each gauge.

C. Locate gauges and thermometers to be easily readable from the floor at a 5'-6" eye level. Use adjustable angle or rigid stem as required. Install gauges in upright position.

D. Install gauges in the following locations: across pumps, chiller cooler and condenser, storage tanks, heat exchangers.

E. Test wells for automatic temperature controls shall be furnished by Building Management Control Section and installed by Mechanical Contractor.

F. Install thermometer in the following locations: Across chiller cooler and condenser, storage tanks, across heat exchangers, across boiler, leaving side of water heater, leaving water side of tempered

water valves, common chilled and hot water lines.

1. Hot water lines: 30°F to 240°F.
2. Chilled water lines: 0°F to 100°F or 120°F

END OF SECTION

SECTION 23 05 23

HVAC VALVES, STRAINERS AND VENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. HVAC Valves

B. Pipe strainer and suction diffusers.

PART 2 - PRODUCTS

2.1 VALVES

A. Pressure Ratings:
1. Unless otherwise indicated, use valves suitable for 125 minimum psig working steam pressure (WSP) and 450°F.
2. The pressure temperature rating of valves shall be not less than the design criteria applicable to components of the system.

B. Butterfly Valves
1. Butterfly valves shall conform to MSS-SP67.
2. Liners, inserts and discs shall be suitable for the intended service.
3. Valves shall have a full lug type body designed for installation between ANSI standard flanges, and shall be rated at full working pressure with downstream flange removed.

C. Balancing Valves
1. Provide balancing valves with:
   a. Corrosion resistant plug with resilient seal when required.
   b. O-ring stem seal.
   c. Permanently lubricated, corrosion resistant bearings.
2. Connections
   a. Through 2" pipe size use threaded connections.
   b. For valves 2-1/2" pipe size and larger shall be provided with 150 psig flange connections.
3. Provide each valve with:
   a. Memory stop.
   b. Plastic drip cap.
   c. 1/8" gauge tap.

D. Ball Valves
1. Provide ball valves with:
   a. Blowout proof stem.
   b. Full size port, 316 stainless steel ball and stem.
   c. Cast bronze body.
   d. Threaded ends.
2. Seat, seals, thrust washers and packing shall be suitable for the intended service.
3. Service rating:
   a. 150 psi saturated steam.
   b. 600 psi WOG.
4. Where piping is insulated, ball valves shall be equipped with 2” extended handles of non-thermal conductive material. Provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation.
5. Provide with memory stop for balancing valves.

E. Valve Connections
1. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves. Sweated joints are not allowed.
2. Thread pipe sizes 2" and smaller.
3. Flange pipe sizes 2-1/2" and larger.

4. Use screw to solder adapters for copper tubing.
5. Use grooved body valves with mechanical grooved jointed piping.

F. Valve Operators
1. Where butterfly valves are provided:
   a. Provide gear operators on valves 6" and larger.
   b. Where valves are located 7' or more above the finished floor in equipment room areas provide chain-operated sheaves. Extend chains to about 5' above floor and hook to clips, arrange to clear walking space.
   c. Lever lock handle with toothed plate for shut-off service and infinitely adjustable handle with lock and nut and memory stop for throttling service on valves 4" and smaller.
   d. Provide worm gear operators on discharge side of pumps for balancing, for all sizes of valves.
   e. All valves 2-1/2” and larger provided by Milwaukee Valve shall be provided with gear operators.

G. Acceptable Manufacturers
1. Dezurik
2. Crane
3. Nibco
4. Keystone
5. Milwaukee Valve

H. Check Valves
1. Bronze body, 2" and smaller, bronze disc (Teflon disc for steam service), regrinding swing check, screw-in cap, threaded connection.
2. Iron body, 2-1/2" and larger, bronze trim, non-slam: stainless steel pins and springs, and bronze plate or bronze mounted, regrind-renew check, bronze seat ring and disc. Provide either wafer or threaded lug.
3. Acceptable Manufacturers
   a. Mission Duochek
   b. Nibco
   c. Keystone
   d. Milwaukee Valve

I. Provide valves of same manufacturer throughout where possible.

J. Provide valves with manufacturer's name and manufacturing location, duty and pressure rating clearly marked on outside of body.

K. Where valves are installed in insulated piping, provide with extended neck so valve operator and stop plate clears the full thickness insulation.

L. Provide valve, seat and trim materials suitable for the intended service.

M. Provide memory stops for all valves used for throttling service. Valves for throttling service shall be butterfly, plug, caged or ball type.

2.2 PIPE SYSTEMS STRAINERS

A. Body:
1. "Y" pattern or basket as shown on the drawings.
2. Line size.
3. Threaded strainer blow down port.
4. ASTM A #126 Class B Cast Iron Body.

B. Construction:
1. 2" size and smaller with screw connections rated 400 psi WOG.
2. Over 2" size with flanged connections, rated 125 psi WOG.

C. Fabricate screens of Monel or type 304 stainless steel:
   1. With 20 mesh woven wire in piping systems through 2".
   2. With 0.45 perforations in piping systems 2-1/2" and 3".
   3. With 0.125 perforations in piping systems 4" and larger.

D. Start-up:
   1. Provide an additional fine mesh disposable screen for use during start-up operations.
   2. Remove after 30 days.
   3. Attach to piping for owners review.

E. Acceptable Manufacturers
   1. Crane
   2. Keckley
   3. Zurn
   4. Mueller
   5. McAlear
   6. Muesco

2.3 SUCTION DIFFUSER

A. For each pump as shown on the drawing, provide an angle type suction diffuser. Body is to fit both the pump inlet and suction pipe size.

B. Components:
   1. Inlet straightening vanes.
   2. Removable end cap.
   3. Gauge ports.
   4. Threaded strainer blow down port.
   5. Adjustable support foot.
   6. Removable magnetic insert.

C. The screen shall be as specified for pipe system strainers.

D. Provide an additional fine mesh disposable strainer for use during start up operations.
   1. Remove after 30 days operation and all flushing is complete.
   2. Attach to piping for owners review.

E. Construction:
   1. 2" size and smaller with screw connections rated 400 psi WOG.
   2. Over 2" size with flanged connections, rated 125 psi WOG.

F. Fabricate screens of Monel or type 304 stainless steel:
   1. With 20 mesh woven wire in piping systems through 2".
   2. With 0.045 perforations in piping systems 2-1/2" and 3".
   3. With 0.125 perforations in piping systems 4" and larger.

2.4 VALVE SCHEDULE

A. Hydronic Service
   1. Chilled Water Service
      a. Ball Valves up to 2": Nibco T-585-70-66 w/Nib-Seal insulated Handle
      b. Butterfly Valve 2-1/2" and larger: Nibco LD - 2000
         Keystone Figure 222
   2. Heating & Condenser Water Service
      a. Ball Valves up to 2": Nibco T-585-70-66
      b. Butterfly Valve 2-1/2" and larger: Nibco LD - 2000
         Keystone Figure 222
   3. Check Valve:
      a. Nibco Check Valve: T - 413 - B
      b. Nibco Check Valve 2-1/2" and larger: F - 918 - B
      c. Nibco Check Valve 2-1/2" and larger: W - 920 -W (Wafer)
      d. Keystone Check 2-1/2" and larger: FIQ 810

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install valves for shut-off and isolating service at each piece of equipment, at vertical risers, and where shown on the drawings.

C. Use butterfly valves and ball valves in circulating water systems, for balancing duty. Provide infinite position gear operator with memory stop.

D. Provide drain valves at main shut-off valves and low points of piping and apparatus so the systems can be entirely drained.
1. 1" valve for pipes 6" and larger.
2. 3/4" valve for pipes smaller than 6".
3. Terminate with pipe plug.
4. Drain valves shall be ball valves.

E. Where valves are installed in insulated pipe, valve operator shall have an insert so the lever or handle will not damage the insulation. Install handles so the lever or handles will not damage the insulation.

F. Provide clearance for installation of insulation and access to valves.

G. Provide access where valves are not exposed.

H. Provide float valves / stilling wells in cooling tower or condenser water basins for water level control. Provide stilling wells around float valve to prevent turbulence ripples or wind interference.

I. Butterfly valves shall be installed per ASME B31.3 Process Piping, and ASME B16.5 Pipe Flanges and Flanged.

3.3 PIPE SYSTEMS STRAINERS

A. Provide an additional fine mesh disposable strainer for use during start up operations.
1. Remove after 30 days operation and all flushing is complete.
2. Attach to piping for owners review.

B. Provide strainer in supply piping for all coil connections.

C. Provide strainer in condenser water piping entering chiller.

3.4 WATER SYSTEM AIR VENTS

A. Provide manual air vents at high points and at any other air pockets of closed circulating pipe systems. Extend 3/8" hard drawn copper tubing discharge drains to nearest floor or hub drain. Provide 1/4" Ball Valve as specified.

B. Where high point vents are not readily accessible provide additional valves at vent termination.

END OF SECTION

SECTION 23 05 48

VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SCOPE

A. Furnish, install, and adjust vibration isolation.

1.2 RELATED WORK

A. Division 23 Mechanical.
   1. Refer to the Section on Ductwork for flexible connections between fans and ducts.
   2. Refer to the Section on Equipment Supports for equipment foundation pads.

1.3 SUBMITTALS

A. Submit product data showing type, size, load, deflection and other information required. Include clearly outlined procedures for installing and adjusting isolators.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Amber Booth
B. Kinetics
C. Mason
D. Korfund
E. VSI.
F. Vibration Eliminator Co., Inc.
G. Metraflex

2.2 ISOLATOR TYPES

A. Neoprene mountings shall have a minimum static deflection of 0.35 inches (9mm). All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the overhang.

B. Flexible spherical expansion joints shall employ Peroxide cured EPDM in the covers, tubes and frictioning of the reinforcement. Reinforcement must be DuPont Kevlar. Solid steel rings shall be used within the raised face rubber ends to prevent pullout. No substitutions for the DuPont Kevlar or the solid steel embedded flange rings are acceptable. Sizes 2 inch (50mm) and larger shall have two spheres reinforced with a metal ring between spheres to maintain shape and complete with split ductile iron or steel flanges with hooked or similar interlocks. Sizes 16 inch (400m) to 24 inch (600mm) may be single sphere. Sizes 3/4 inch (20mm) to 1-1/2 inch (40mm) may have threaded bolted flange assemblies, one sphere and cable retention. 14 inch (300mm) and smaller connectors shall be rated at 250 psi (17 BAR) up to 190°F (88°C) with a uniform drop in allowable pressure to 190 psi (13 BAR) at 250°F (121°C). 16 inch (400mm) and larger connectors are rated 180 psi (12 BAR) at 190°F (88°C) and 135 psi (9 BAR) at 250°F (121°C). Safety factors to burst and flange pullout shall be a minimum of 3/1. All joints must have permanent markings verifying a 5 minute factory test at twice the rated pressure. Concentric reducers to the above specifications may be substituted for equal ended expansion joints.

   High pressure joints shall be substituted for the above where operating pressures are higher than standard. Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods. Control rods are not desirable in seismic work. If control rods are used, they must have ½- inch (12mm) thick Neoprene washer bushings large enough in area to take the thrust at 1000 psi (6.9 N/mm5) maximum on the washer area. Standard diameter bolt washers are not acceptable.

Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves.

C. Hangers shall consist of rigid steel frames containing minimum 1-1/4 inch (32mm) thick neoprene elements at the top and a steel spring with general characteristics as in specification B seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. In order to maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30-degree arc from side to side before contacting the cup bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30-degree capability.

2.3 ISOLATOR APPLICATION

EQUIPMENT	ISOLATOR TYPE	MINIMUM DEFLECTION
Chiller	A	0.35”
Suspended Fan Coil Units	C	0.5”
Condensing Units	A	0.35”
In-Line Fans	C	0.5”

2.4 PIPING ISOLATOR APPLICATIONS

EQUIPMENT	ISOLATOR TYPE
Floor Mounted Pumps	B
Suspended Pumps	B
Chiller Pipe Connections	B

2.5 FLEXIBLE CONNECTIONS IN PIPING AT PUMPS

A. Provide flexible connections at suction and discharge of chilled water, and hot water pumps, piping connections on chillers and where indicated on drawings. Refer to schedule above.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Stock Requirements. The isolation manufacturer's representative shall maintain an adequate stock of springs and isolators of type used so that changes required during construction and installation can be made.

B. Factory Representation. After installation, furnish factory-trained representative of the isolation manufacturer to check various isolators and report measured versus anticipated deflection on all isolators. Have the representative certify that isolators have been installed in accordance with manufacturer's recommendations and approved submittals. Provide written report to Engineer indicating compliance prior to final acceptance.

END OF SECTION

SECTION 23 05 93

TESTING, BALANCING AND ADJUSTING (TAB) OF ENVIRONMENTAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Balance, adjust and test the air distribution system including the exhaust system.

B. Balance, adjust and test the hydronic system.

C. Verify and record the duct test results performed by the mechanical contractor.

1.2 RELATED SECTIONS

A. COORDINATION OF TESTING AND BALANCING

1.3 PAYMENT PROCEDURES

A. The work of this Section of the Specifications shall be paid directly by the Owner.

1.4 SUBMITTALS

A. History of the TAB organization.

B. Agency certification.

C. Personnel qualifications.

D. TAB data forms.

E. Instrumentation list.

F. Name of the project supervising engineer.

G. Name and address and contact person of five successfully completed projects of similar size and scope.

H. To perform required professional services, the balancing agency shall have a minimum of one test and balance engineer certified by the Associated Air Balance Council.

1.5 TAB FIRM QUALIFICATIONS

A. The organization performing the work shall be a Certified member in good standing of the (AABC) Associated Air Balance Council.

B. Able to furnish evidence of having contracted for and completed not less than five systems of comparable size and type that have served their Owners satisfactorily for not less than five years.

C. A specialist in this field and have the personnel, experience, training, skill, and the organization to perform the work.

D. The balancing agency shall furnish all necessary calibrated instrumentation to adequately perform the specified services. An inventory of all instruments and devices in possession of the balancing agency may be required by the engineer to determine the balancing agency's performance capability.

E. The balancing agency shall have operated for a minimum of five years under its current name.

F. Personnel:
1. The project supervisor shall be a Professional Engineer registered in Texas.
a. Extensive knowledge of the work involved.

b. At least five years experience conducting tests of the type specified.
c. This test and balance engineer shall be responsible for the supervision and certification of the total work herein specified.

2. All work shall be conducted under the direct supervision of the supervising engineer.
3. Technicians shall be trained and experienced in the work they conduct.

1.6 WARRANTY

A. Provide (AABC) guarantee in writing.

B. Extended warranty.
1. Include an extended warranty of 2 years after completion of test and balance work, during which time the Architect/Engineer may request a retest or resetting of any outlet or other items as listed in the test report.
2. Provide technicians and instruments to assist the Architect/Engineer in making any tests he may require during this period.
3. The balancing agency shall perform an inspection of the HVAC system during the opposite season from that which the initial adjustments were made. The balancing agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 TAB TOLERANCES

A. The water, outside air, supply air, return air, and exhaust air for each system shall be adjusted to within +/- 5% of the value scheduled on the drawings.

3.2 SITE VISITS

A. During construction, the balancing agency shall inspect the installation of the piping systems, sheetmetal work, temperature controls, energy management system, and other component parts of the heating, ventilating, and air conditioning systems. One inspection shall take place when 60% of the ductwork is installed and another inspection shall take place when 90% of the equipment is installed. The balancing agency shall submit a brief written report of each inspection to the architect and engineer.

B. Upon completion of the installation and start-up of the mechanical equipment by the mechanical contractor, the balancing agency shall test and balance the system components to obtain optimum conditions in each conditioned space of the building. If construction deficiencies are encountered that preclude obtaining optimum conditions, and the deficiencies cannot be corrected by the mechanical contractor within a reasonable period of time, the balancing agency shall cease testing and balancing services and advise the architect, engineer, general contractor and owner, in writing, of the deficiencies.

C. Note proper piping installation, location of valves, and flow measuring instruments.

D. Make one series of visits, phased as required by construction progress, prior to installation of the ceiling. Note proper installation of balancing dampers.

E. Continue the site visits up to completion of project. In each succeeding report, list corrections made from previous reports.

3.3 TESTING INSTRUMENTS

A. Submit a list of all instruments to be used for the test and balance procedures.
1. Catalog sheets
2. Certificate of last calibration
3. Calibration within a period of six months prior to balancing

B. Testing equipment shall be in good working order and tested for accuracy prior to start of work.

3.4 COORDINATION WITH OTHER SPECIFICATION SECTIONS

A. Review the related ductwork shop drawings and piping shop drawings. Make recommendations concerning suitability with respect to the testing, balancing and adjusting work.

B. Make tests to verify proper placement of the static pressure sensors for the variable air volume fan system control.

C. In cooperation with the work specified in Building Management and Control System section, a systematic listing of the testing and verification shall be included in the final TAB report. The TAB firm shall provide a laptop computer to operate with the Building Management and Control System. Building Management and Control System shall provide all necessary software and special interface cables, as required, to communicate with the DDC system:
1. Work with the temperature control contractor to ensure the most effective total system operation within the design limitations, and to obtain mutual understanding of the intended control performance.
2. Verify that all control devices are properly connected.
3. Verify that all dampers, valves, and other controlled devices, are operated by the intended controller.
4. Verify that all dampers and valves are in the position indicated by the controller (open, closed or modulating).
5. Verify the integrity of valves and dampers in terms of tightness of close-off and full open positions. This includes dampers in multizone units, terminal boxes and fire/smoke dampers.
6. Observe that all valves are properly installed in piping system in relation to direction of flow and location.
7. Observe the calibration of all controllers.
8. Verify the proper application of all normally opened and normally closed valves.
9. Observe the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.
10. Observe the location of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Control contractor will relocate as deemed necessary by the Engineer.
11. Verify that the sequence of operation for any control mode is in accordance with the approved shop drawings and specifications. Verify that no simultaneous heating and cooling occurs.
12. Verify the correct operation of all interlock systems and installation is per the manufacturer recommendations.
13. Check all dampers for free operation.
14. Verify that all controller setpoints meet the design intent.
15. Perform variable volume system verification to assure the system and its components track with changes from full flow to minimum flow.

D. Upon completion of the testing and balancing, submit three days prior notice that the systems are ready for a running test. A qualified representative of the test and balance organization shall be present, with a representative from the engineers office, to field verify TAB report readings. Specific and random selections of data recorded in the certified test and balance report will be reviewed.

3.5 INSTRUMENT TEST HOLES

A. When it is required to make holes in the field to measure temperature, static pressure or velocity in the ducts:
1. Drill holes, plug and tape external duct insulation.
2. Repair damaged insulation to Engineer’s approval.

3.6 TESTING THE AIR DISTRIBUTION SYSTEM

A. The TAB agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set full open. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards and all results shall be recorded in the TAB report:

1. Supply Fans:
   a. Fan speeds: Test and adjust fan RPM to achieve design CFM requirements.
   b. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
   c. Pitot-Tube Traverse: Perform a Pitot-Tube traverse of the main supply and return ducts, as applicable, to obtain total CFM. If a Pitot-Tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. Measurements must be recorded with an Inclined Manometer or an Inclined/Vertical Manometer.
   d. Outside Air: Test and adjust the outside air on applicable equipment using a Pitot-Tube traverse. If a Pitot-Tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. If a traverse is not practical, use the mixed air temperature method, if the inside and outside temperature difference is at least 20°F, or use the difference between Pitot-tube traverse of the supply and return ducts.
   e. Static Pressure: Test and record system static pressure, including the static pressure profile of each supply fan.
2. All Other Fans:
   a. Fan speeds: Test and adjust fan RPM to achieve design CFM requirements.
   b. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
   c. Pitot-Tube Traverse: Perform a Pitot-Tube traverse of the main return ducts, as applicable, to obtain total CFM. If a Pitot-Tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. Measurements must be recorded with an Inclined Manometer or an Inclined/Vertical Manometer.
   d. Static Pressure: Test and record system static pressure, including the static pressure profile of each return fan.
3. VAV Terminal Units:
   a. Set and record volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements.
   b. Identification: Identify the type, location, and size of each terminal unit. This information must be recorded on the terminal box data sheets.
4. Diffusers, Registers and Grilles:
   a. Tolerances: Test, adjust, and balance each diffuser, grille, and register to within 5% of design requirements. Minimize drafts. Observe throws are in direction as indicated on drawings.
5. Coils (including electric coils):
   a. Air Temperature: Once air flows are set to acceptable limits, take wet bulb (cooling coil only) and dry bulb air temperatures on the entering and leaving side of each coil. Calculate the sensible and latent (cooling coil only) capacity of the coil. Provide information in TAB report.

B. Record preliminary air handler data, including fan RPM and static pressures across filter, fans and coils.

C. Perform a velocity traverse of the main supply ducts using a pitot-tube and inclined manometer to establish initial air delivery. Perform a Pitot-tube traverse of main supply and return ducts, as applicable, to obtain total CFM. If a pitot-tube traverse is not practical, a detailed explanation of why a traverse was not made must appear on the appropriate data sheet.

D. Where air measuring stations are installed, use pitot tube traverse readings to verify and record the correct calibration of the stations output.

E. Make adjustments in fan RPM and damper settings, as required, to obtain design supply air, return air, and outside air.

F. Measure and adjust all supply and return branches to design air delivery.

G. Measure and adjust all diffusers to design air delivery to +/- 5% of design requirements.

H. Make a set of recordings showing final system conditions.

3.7 TESTING THE HYDRONIC SYSTEMS

A. The TAB agency shall, as applicable, verify that all hydronic equipment, piping, and coils have been filled and purged; that strainers have been cleaned; that water has been flushed and is in a clean condition, and that all balancing valves (except bypass valves) are set full open. As applicable, check air vents and expansion or compression tank for proper operation. The TAB agency shall perform the following testing and balancing functions in accordance with the AABC National Standards and all results shall be recorded in the TAB report:
   1. Record preliminary pump data.
      a. Pump RPM.
      b. Pump shut-off differential head.
      c. Pump operating differential head.
      d. Check and verify pump alignment.
      e. Verify impeller diameter.

B. Adjust balancing valves in the pump discharge lines to obtain design water quantity as read from the manufacturer's pump curve and from a flow meter.

C. In variable flow systems, the water flow of the pump shall be set at the scheduled gpm, not the total of all the valves. Determine the diversity of the system and balance the individual coils with the maximum pump water quantity flowing in the system.

D. Balance flow through:
   1. Chillers.
   2. Coils.
   3. Boiler.
   4. Pumps
   5. Condensers.
   6. Cooling tower.
   7. Heat Exchanger.

E. Use flow meters, differential pressures and temperature relationships as required.

F. Balance by-pass lines to obtain the same pressure drop with systems on by-pass as full flow through the coil including the valve.

G. Repeat steps, as required, to obtain a final systems balance and make a set of recordings showing final systems conditions.

H. Pumps:
   1. Test and adjust pumps to meet design water flow requirements. Check pumps for proper operation. Pumps shall be free of vibration and cavitation Record appropriate gauge readings for final TDH and Block-Off\Dead head calculations. Check and verify pump alignment.
   2. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure pump motor is not in or above the service factor.

I. Coils:
   1. Tolerances: Test, adjust, and balance all chilled water and hot water coils within 5% of design flow requirements.
   2. Verification: Verify the type, location, final pressure drop and water quantity (GPM) of each coil. Calculate the actual capacity of all coils. This information shall be recorded on coil data sheets.

J. Boilers:
   1. Verify that boilers have been filled and started by others, and are in operation.
   2. Current and Voltage: As applicable, test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.
   3. Test, adjust and record water flows through water boilers.

4. Test and record water temperature profiles of each boiler.

K. Chillers:
1. Verify that chillers have been started by the manufacture and are in operation. Test and adjust chiller water flows to within 5% of the design requirements by using a U-TUBE manometer and setting balancing valves.
2. Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure compressor motor is not in or above the service factor.
3. Test and record temperature profiles of each chiller at design water flow.

L. Heat exchangers:
1. Verify that heat exchangers have been filled and started by others, and are in operation.
2. Test and record temperature and pressure profiles of water and steam heat exchangers.

3.8 EQUIPMENT POWER READINGS

A. Record the following information for each motor:
1. Equipment designation.
2. Manufacturer.
3. Unit model number and serial number and frame.
4. Motor nameplate horsepower; nameplate voltage; phase and full load amperes.
5. Heater coil in starter.
   a. Rating in amperes.
   b. Manufacturer's recommendation.
6. Motor RPM/driven equipment RPM.
7. Power reading (voltage, amperes of all legs at motor terminals).

3.9 BOILERS

A. Check for proper operation and with operation at near design conditions, record the following:
1. Manufacturer, model number, serial number and nameplate.
2. If water type, water flow in GPM, entering and leaving water temperature and water pressure drop in feet.
3. Type of fuel and heating value.
4. Rate of fuel consumption.
5. Capacity in MBH.
6. Efficiency.
7. Flue gas analysis.
8. Motor data.

B. Observe demonstration that all controls and safety devices are functioning properly. Record observations.

3.10 CHILLERS (Air Cooled)

A. Balance flow of water through each evaporator to be within a range of 100% to 110% of design flow with all pumps operating. With only one pump operating, the maximum flow shall not exceed the maximum tube velocity recommended by the manufacturer.

B. Verification of safety interlocks and controls are the responsibility of the manufacturer.

C. With each chiller operating at near design temperature conditions, measure and record the following:
1. Manufacturer, model number, serial number and all nameplate data.
2. Evaporator water entering temperature, leaving temperature, pressure drop (ft.) and water quantity (GPM).
3. Condenser air entering temperature, leaving temperature.
4. Evaporator and condenser refrigerant temperatures and pressures (using instruments furnished with the machine by the manufacturer).
5. Volts and amps for each phase.
6. Power factor.
7. KW input.

8. Tons of cooling.
9. KW per ton of cooling.

D. Reference chiller specification for additional requirements.

3.11 DIRECT EXPANSION EQUIPMENT

A. With each unit operating at near design conditions, measure and record the following:
1. Manufacturer, model number, serial number and all nameplate data.
2. Ambient temperature, condenser discharge temperature.
3. Amperage and voltage for each phase.
4. Leaving and entering air temperatures.
5. Suction and discharge pressures and temperatures.
6. Tons of cooling.
7. Verification that moisture indicator shows dry refrigerant.

3.12 TAB REPORT

A. The activities described in this specification shall be recorded in a report form; and four individually bound copies shall be provided to the Architect and Engineer. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of the test instruments used and list all measurements taken after all corrections are made to the system. Record all failures and corrective action taken to remedy any incorrect situation. The intent of the final report is to provide a reference of actual operating conditions for the Owner's operations personnel. Provide a "Preface" which shall include a general discussion of the system and any abnormalities or problems encountered.

B. All measurements and recorded readings (of air, water, electricity, etc.) that appear in the report must have been recorded on site by the permanently employed technicians or engineers of the TAB firm.

C. Submit reports on forms approved by the engineer that will include the following data as a minimum:
1. Title Page
a. Company Name
b. Company Address
c. Company telephone number
d. Project name
e. Project location
f. Project Manager
g. Project Engineer
h. Project Contractor
I. Project Identification Number
2. Summary of the TAB report data
3. Index
4. Instrument List
a. Instrument
b. Manufacturer
c. Model
d. Serial Number
e. Range
f. Calibration Date
g. What test instrument is to be used for:
5. Fan Data
a. Location
b. Manufacturer
c. Model
d. Air flow, specified and actual
e. Total static pressure (total external) specified and actual
f. Inlet pressure
g. Discharge pressure
h. Fan RPM
6. Return Air/Outside Air Data

a. Identification/location
b. Design return air flow
c. Actual return air flow
d. Design outside air flow
e. Actual outside air flow
f. Return air temperature
g. Outside air temperature
h. Required mixed air temperature
I. Actual mixed air temperature

7. Electric Motors
   a. Manufacturer
   b. HP/BHP
   c. Phase, voltage, amperage, nameplate, actual
   d. PM
   e. Service Factor
   f. Starter size, heater elements, rating
8. V-Belt Drive
   a. Identification/location
   b. Required driven RPM
   c. Drive sheave, diameter and RPM
   d. Belt, size and quantity
   e. Motor sheave, diameter and RPM
   f. Center-to-center distance, maximum, minimum and actual
9. Duct Traverse
   a. System zone/branch
   b. Duct size
   c. Area
   d. Design velocity
   e. Design air flow
   f. Test velocity
   g. Test air flow
   h. Duct static pressure
   I. Air correction factor
10. Air Monitoring Station Data
    a. Identification/location
    b. System
    c. Size
    d. Area
    e. Design velocity
    f. Design air flow
    g. Test velocity
    h. Test air flow
11. Air Distribution Test Sheet
    a. Air terminal number
    b. Room number/location
    c. Terminal type
    d. Terminal size
    e. Correction factor
    f. Design velocity
    g. Design air flow
    h. Test (final) velocity
    i. Test (final) air flow
12. Pump Data
    a. Identification/number
    b. Manufacturer
    c. Size/model
    d. Impeller
    e. Service
    f. Design flow rate, pressure drop, BHP
    g. Actual flow rate, pressure drop, BHP
    h. Discharge pressure
    I. Suction pressure

j. Total operating head pressure
k. Shut off, discharge and suction pressures
l. Shut off, total head pressure
m. Pressure differential settings

13. Cooling Coil Data
    a. Identification/number
    b. Location
    c. Service
    d. Manufacturer
    e. Entering air DB temperature, design and actual
    f. Entering air WB temperature, design and actual
    g. Leaving air DB temperature, design and actual
    h. Leaving air WB temperature, design and actual
    i. Water pressure flow, design and actual
    j. Water pressure drop, design and actual
    k. Entering water temperature, design and actual
    l. Leaving water temperature, design and actual
    m. Air pressure drop, design and actual
    n. Capacity - sensible and latent
14. Heating Coil Data
    a. Identification/number
    b. Location
    c. Service
    d. Manufacturer
    e. Entering air DB temperature, design and actual
    f. Leaving air DB temperature, design and actual
    g. Water pressure flow, design and actual
    h. Water pressure drop, design and actual
    i. Entering water temperature, design and actual
    j. Leaving water temperature, design and actual
    k. Air pressure drop, design and actual
    l. Capacity
15. Electric Coil Data
    a. Identification/number
    b. Location
    c. Service
    d. Manufacturer
    e. Entering air DB temperature, design and actual
    f. Leaving air DB temperature, design and actual
    g. Electrical Characteristics
    h. Capacity
16. Sound Level Report
    a. Location (Location established by the design engineer)
    b. N C curve for eight (8) bands-equipment off
    c. N C curve for eight (8) bands-equipment on
17. Vibration Test on equipment having 10 HP motors or greater in size.
    a. Location of points:
        1) Fan bearing, drive end
        2) Fan bearing, opposite end
        3) Motor bearing, center (if applicable)
        4) Motor bearing, drive end
        5) Motor bearing, opposite end
        6) Casing (bottom or top)
        7) Casing (side)
        8) Duct after flexible connection (discharge)
        9) Duct after flexible connection (suction)
    b. Test readings:
        1) Horizontal, velocity and displacement
        2) Vertical, velocity and displacement
        3) Axial, velocity and displacement
    c. Normally acceptable readings, velocity and acceleration
    d. Unusual conditions at time of test
    e. Vibration source (if non-complying)

18. Control verification indicating date performed and any abnormalities identified.
    a. Point Location/Description
    b. EMS Readout (Setpoint and Actual)
    c. Actual Readout of all points
    d. Interlocks
    e. Safeties
    f. Variable speed drive tracking with EMS input
    g. Variable speed drive Bypass operation
    h. Sequence of operation

END OF SECTION

SECTION 23 05 94

COORDINATION OF TESTING AND BALANCING

PART 1 - TESTING, BALANCING AND ADJUSTING

1.1 WORK INCLUDED

A. Balancing and adjusting of the environmental systems is specified in Section 23 05 93.

B. Coordination of the work is specified in this Section.

PART 2 - PRODUCTS / NOT USED

PART 3 - EXECUTION

3.1 COORDINATION

A. Bring the work to a state of readiness for testing, balancing, and adjusting.
1. Install air terminal devices.
2. Provide specified filters in air handling equipment. Install clean filters just prior to the start of the test and balance work.
3. Verify lubrication of equipment.
4. Install permanent instrumentation.
5. Clean piping systems and fill with clean water.
6. Complete "Start-up" of equipment.
7. Check rotation and alignment of rotating equipment and tension of belted drives.
8. Verify ratings of overload heaters in motor starters.
9. Verify that safety and operating control set points are as designed and automatic control sequences have been checked.
10. Provide control diagrams and sequence of operation.
11. Collect material for maintenance manuals and prepare one manual especially for use in testing and balancing.
12. Verify that graphic operational data such as start/stop instructions, valve tag schedules, and piping identification schedules have been provided where needed.
13. Verify that equipment and piping identification work has been completed with valve tags, schedules, and piping identification system.
14. Comb out fins on extended-surface heat transfer coils where damaged.
15. Clean all strainers as required.
16. Remove construction strainers after water is cleaned and treated.
17. Remove all temporary filters from HVAC equipment.
18. Provide start-up reports listing all start-up information and manufacturer’s information attached.

B. Provide and install new pulleys and belts as required to effect the correct speed ratio. Adjustments where no belt or pulley change is required, is specified in Section 23 05 93.

C. Verify that the systems are ready for balancing and adjusting.

D. Submit a letter stating:
1. The specified pieces of equipment have been checked, started, and adjusted by the manufacturer.
2. Other equipment has been checked and started.
3. The systems have been operated for the specified period of time.
4. The automatic controls system has been adjusted, calibrated, and checked, and is operating as specified.

E. Provide the services of a technician full time at all times at the project when testing, balancing and adjusting work is being conducted.

F. Provide instrumentation and services to take readings of the required data for the refrigerant circuits.

G. Provide and install volume dampers required for balancing by the TAB Contractor.

3.2 START-UP OF EQUIPMENT

A. Pre-start & Start-up equipment using the procedures as recommended by the manufacturers.

B. Complete start-up of equipment prior to start of testing & balancing.

C. Submit start-up procedures as outlined by the manufacturers and complete the "HVAC FAN / AIR HANDLING / START-UP REPORT FORM" to Engineer.

HVAC FAN / AIR HANDLING UNIT / START-UP REPORT FORM														
Equipment Description	Actual			Disc. Switch Wired	Rotation Correct	Belt		RPM Correct Submittal	Vibration Isolation Correct	Attachment To Roof Curb	List Of Damage Parts	Bearings Lubricated	Filter Installed	Interlocks & Dampers Operational
	Voltage	Amps	HP			Condition & Part #	Tension Correct							

END OF SECTION

SECTION 23 07 13

EXTERNAL DUCT INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install external insulation on supply, return, exhaust and outside air ductwork.

B. External insulation of concealed and exposed ducts is included in this Section. Internal acoustic duct lining is specified under ductwork and not included in this Section.

1.2 RELATED WORK

A. Division 9 - FINISHES. Painting and Color Coding.

B. Division 23 - MECHANICAL.
1. Air Handling Units. Internal insulation for air units is specified in the sections on air handling units. The units do not require external insulation.
2. Internal Duct Liner. Internal duct liner is specified in the section on ductwork.
3. Insulation. Refer to specific sections on individual insulation types.
4. Refer to insulation and liner plan detail.

1.3 QUALITY ASSURANCE

A. The intent of insulation specifications is to obtain superior quality workmanship, resulting in an installation that is absolutely satisfactory in both function and appearance. Provide insulation in accordance with the specifications for each type of service and apply as recommended by the manufacturer and as specified.

B. An approved contractor for this work under this Division shall be:
1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their Owners satisfactorily for not less than 3 years.

C. All duct insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.

D. Condensation on any insulated system is not approved.

E. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

F. Where existing insulated ductwork or other services are tapped, remove existing insulation back to undamaged sections and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

1.4 APPROVALS

A. Submittals. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 1 General Requirements and obtain approval before beginning installation. Include product description, list of materials and thickness for each service and location, and the manufacturer's installation instructions for each product.

B. Sample Application. Make an application of each type of insulation to display the material, quality

and application method. Obtain approval of the sample application before proceeding with installation of the work.

PART 2 - PRODUCTS

2.1 INSULATION

A. Glass fiber rigid duct insulation.
1. Minimum density of 3 pcf, installed R value to be 6.0 (when located in a conditioned plenum) and minimum density of 0.75 pcf, installed R value to be 8.0 (when located in an unconditioned plenum) at 75°F mean, facing of 0.7 mil aluminum foil reinforced with glass yarn mesh and laminated to 40 lbs. fire-resistant Kraft. R-value to be indicated on exterior side of insulation to be verified by City inspector.
2. Acceptable Manufacturers
a. Schuller 814 spin-glas FSK.
b. Owens-Corning Type 703 board RKF.
c. Knauf 3 PCF FSK.

B. Glass fiber blanket duct insulation.
1. Minimum density of 1.0 pcf, installed R value to be 6.0 (when located in a conditioned plenum) and minimum density of 0.75 pcf, installed R value to be 8.0 (when located in an unconditioned plenum) at 75°F mean, facing of 0.35 mil foil reinforced with glass yarn mesh and laminated to 40 lbs. fire resistant Kraft. R-value to be indicated on exterior side of insulation to be verified by City inspector.
2. Acceptable Manufacturers
a. Manville R-series Microlite FSKL.
b. Owens-Corning ED100 RKF.
c. Knauf 1.0 PCF FSK.

C. Fiberglass reinforcing cloth mesh.
1. Acceptable Manufacturers
a. Perma Glass Mesh.
b. Alpha Glass Mesh.
c. Childers Chil-Glas #10
d. Foster Mast a Fab
e. Vimasco.

D. Mastics, sealants, coatings and adhesives.
1. Acceptable Manufacturers
a. Childers.
B. Foster.
c. Vimasco.

E. Fireboard Insulation
1. Totally encapsulated with foil facing.
2. Two hour rated fire protection.
3. Zero clearance to combustible protection.
4. System shall be listed and labeled by an NRTL.
5. Tested per ISO 6944, Type A Duct and achieve a 2 hour rating for stability, integrity and insulation.
6. Provided system is subject to the approval of the Local Authority Having Jurisdiction.
7. Acceptable Manufacturers
a. Unifrax ON Fyrewrap Elite 1.5
b. Partak Insulation, Inc. Paroc Fireboard
c. Thermal Ceramics FireMaster 3M
d. Premier Refractories International, Pyroscat.

F. Rigid Closed Cell Insulation
1. Acceptable Manufacturers
a. Dow Trymer.
b. Phenolic Foam.

G. Reinforced Foil Tape
   1. Acceptable Manufacturers
      a. Venture 1525CW
      b. 3” FSK
   2. Thickness 6.5 mils
   3. Color: silver

2.2 COATING AND ADHESIVE

A. Coating. Provide Childers CP-38 or Foster 30-80 vapor barrier coating. Coating must meet MIL Spec C-19565C, Type II and be QPL Listed. Permeance shall be 0.013 perms or less at 43 mils dry. Tested at 100ºF and 90% RH per ASTM E96.

B. Outdoors: Provide as insulation coating Childers Encacel X or Foster Monolar 60-90. Permeance shall be 0.03 perms or less at 30 mils dry. Tested at 100ºF and 90% RH per ASTM F 1249.

C. Adhesive. Provide Childers CP-82 or Foster 85-20 vapor barrier adhesive.

D. Reinforcing Mesh. Provide 10 x 10 white glass or polyester reinforcing mesh.

2.3 OUTDOOR DUCT LAMINATED JACKETING

A. Rubberized bitumen compound material:
   1. Ultraviolet resistant
   2. Weatherproof
   3. Vapor retarding jacketing
   4. Laminated jacketing
   5. Cross-laminated high strength polyethylene film
   6. Laminated to aluminum foil
   7. Minimum 60-mil thickness

B. Acceptable Manufacturers:
   1. Alumaguard 60
   2. Flex Clad 400
   3. Venture Clad 1577CW

PART 3 - EXECUTION

3.1 FIRE SAFETY REQUIREMENTS

A. Do not extend duct coverings through walls or floors required to be fire-stopped or required to have a fire resistance rating. Interrupt duct coverings in the immediate vicinity of heat sources such as electric resistance or fuel-burning heater.

3.2 CONCEALED DUCT

A. Provide flexible glass fiber insulation with factory-applied, reinforced UL labeled Foil-Skrim-Kraft (FSK) facing.

B. Standing Seams. Insulate standing seams and stiffeners, which protrude through the insulation with 0.6 lb. per cubic foot density, 1-1/2” thick, faced, flexible blanket insulation. Insulation shall not prevent adjustment of damper operators.

C. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2”. In addition, secure insulation to the bottom of rectangular ductwork by the use of either weld pins with washers or cup-head pins welded to the ductwork or perforated based insulation hangers glued to the duct on twelve inch centers to prevent sagging of insulation.

D. On circumferential joint, the 2” flange on the facing shall be stapled with 9/16” outward clinch steel staples on 2” centers and taped using 3” wide foil tape applied with additional adhesive of Foster

85-75. Cover all seams, joints, pin penetrations and other breaks with foil tape and glue.

E. Ductwork in mechanical rooms is considered concealed spaces.

3.3 EXPOSED DUCT INSULATION

A. Ductwork in exposed locations is to be insulated with fiberglass rigid / semi-rigid board insulation.
1. Apply fabric and mastic to provide a smooth surface for painting.

B. Standing Seams: Insulate standing seams and stiffeners which protrude through the insulation with 0.6 lb per cubic foot density, 1-1/2 inch thick, faced insulation. As a vapor seal, use reinforcing mesh with vapor barrier coating. Insulation shall not prevent adjustment of damper operators.

C. Insulation shall be wrapped tightly on the ductwork. Adhere insulation to ductwork with adhesive. In addition, secure insulation to the bottom of rectangular ductwork by the use of either weld pins with washers or cup-head pins welded to the ductwork or perforated based insulation hangers glued to the duct on 12 inch centers to prevent sagging of insulation.

D. Cover all seams, joints, pin penetrations and other breaks with coating reinforced with reinforcing mesh. Fabric shall not be visible after coating.

3.4 OUTDOOR DUCTWORK COVERING

A. Cover all supply and return ductwork outdoors:
1. 1-1/2” thick, rigid closed cell insulation with reinforced foil facing.

B. Install a high point in center and slope in both directions so water will not stand on horizontal surfaces.

C. Impale the insulation over mechanical fasteners and washers.
1. A minimum of 2 rows of fasteners per side on 12-inch centers.
2. Seal all breaks, joints and punctures by applying a 1/8” thick vapor barrier mastic coating, embedded in open mesh reinforcing mesh.

D. Standing S, or flanged connections shall be covered with the same thickness of insulation overlapped a minimum of 4”.

E. Apply a tack coat of Childers CP-10/11 or Foster 46-50 weather barrier mastic over the entire surface.
1. While this coat is still tacky, Childers #5 glass fiber reinforcing mesh shall be smoothly applied and pressed into the mastic. The cloth shall be taut with adjacent edges overlapped a minimum of 4”.
2. After the first coat of mastic has taken its set, the second coat shall be applied over the cloth by palm, trowel, or spray to sufficient thickness that, when dried, the combined thickness of mastic and cloth is not less than 1/8”.
3. Upon completion, the openings in the cloth shall be completely sealed and the yarn shall not be visible. The completed work shall be completely smooth and present a plane surface.
4. Aluminum gray or white finish as approved by the Architect.

F. Standing water on horizontal surfaces is not approved.

G. Apply outdoor duct laminated jacketing protection over entire insulation surface. Apply rubberized bitumen compound, applied to a cross-laminated high strength polyethylene film, laminated to aluminum foil.

3.5 KITCHEN GREASE EXHAUST DUCTWORK / KILN DUCTWORK / FUME HOOD DUCT

A. Secure fireboard insulation to duct with impaling pins and 3” square speed clips. In addition, provide a wire mesh support system and additional sealing or support as required by the code enforcing authority. The insulation support system shall include framed access to allow the

insulation to be removed and replaced without damage at the access doors in the duct system for inspection and cleaning. Coordinate location of access openings to correspond accurately. Provide stainless steel banding on 12” centers.

3.6 GENERAL INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Apply insulation on clean, dry surfaces only.

C. Continue insulation with vapor barrier through penetrations.

D. Neatly finish insulation at supports, protrusions and interruptions.

E. Install insulation on clean, dry surfaces, and only after building is weatherproofed sufficiently to preclude any rainwater on insulation.

F. Apply mastic over the fiberglass reinforcing mesh to a thickness where fabric is not visible after completion.

G. Install fiberglass blanket duct insulation on top of supply air grilles not fire rated.

END OF SECTION

SECTION 23 07 16

VESSEL INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install insulation for both high and low temperature vessels.

B. Low temperature installations include expansion tanks, air eliminators, chiller nozzles, chiller heads and other vessels containing liquids 60°F and below.

C. High temperature installations include expansion tanks, air eliminators, domestic water storage tanks, boiler stack / transition and other vessels containing liquids above 60°F.

1.2 QUALITY ASSURANCE

A. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation that is absolutely satisfactory in both function and appearance. Provide insulation in accordance with the specifications for each type of service and apply as recommended by the manufacturer and as specified.

B. An approved contractor for this work under this Division shall be:
1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their owners satisfactorily for not less than 3 years.

C. All vessel insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50, as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.

D. Condensation on any insulated vessel system is not acceptable.

E. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation, also repair any damage caused by the condensation.

F. Where existing insulated vessel, or other surfaces are tapped, remove existing insulation back to undamaged sections for hot surfaces or to nearest insulation stop for cold surfaces, and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

1.3 APPROVALS

A. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 1 General Requirements and obtain approval before beginning installation. Include product description, list of materials and thickness for each service and location and the manufacturer's installation instructions for each product.

B. Make an application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with installation of the work.

1.4 RELATED WORK

A. Division 9 Finishes. Painting and color-coding

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Glass fiber pipe & tank insulation:
   1. Schuller Type 817
   2. Owens-Corning Type 705
   3. Knauf 2.8 PCF

B. Closed cell, non-wicking pipe & tank insulation:
   1. Armaflex FS, 2” thickness

C. Aluminum Jacketing:
   1. Childers
   2. Pabco
   3. RPR

D. Monel Staples
   1. Bostich Monel
   2. Duo-Fast Monel
   3. Markwell Monel

E. Fiberglass reinforcing cloth mesh:
   1. Perma Glass Mesh
   2. Alpha Glass Mesh
   3. Childers Chil-Glas
   4. Foster Mast a Fab

F. Weather Resistant Coating:
   1. WB Armaflex Finish

2.2 CEMENT, MASTICS, SEALANTS, ADHESIVES AND COATINGS

A. Adhesive: Provide Childers CP-127 or Foster 85-60 fiberglass adhesive to seal insulation for low temperature vessels.

B. Adhesive / Joint Sealant: Provide Armaflex 520 adhesive to seal insulation for low and temperature vessels.

C. Lagging Adhesive / Coating: Furnish Childers CP50AHV2 or Foster 30-36 lagging adhesive / coating to provide a finish coat and to secure finish cloth for high temperature vessels.

D. Insulation Joint Sealant: Use Childers CP-76 or Foster 95-50 to seal the joints of insulation on low temperature vessels.

E. Metal Jacketing Sealant: Use Childers CP-76 or Foster 95-44 on all metal jacketing laps outdoors.

F. Vapor Barrier Coating: Indoors - Use Childers CP-38 or Foster 30-80 vapor barrier coating finish to coat the canvas finish on low temperature vessels. Permeance shall be 0.013 perms or less as tested by ASTM E96. Coating must comply with MIL-C-19565C, Type II and be QPL listed. Permeance shall be 0.03 perms or less at 30 mils, dry. Tested at 100°F and 90% RH per ASTM F 1249 and by Hypalon rubber based.

G. Weather Barrier Mastic: Furnish Childers CP-10/11 or Foster 46-50 weather barrier mastic and reinforcing mesh for outdoor finish.

H. Reinforcing Mesh: Furnish 10 X 10 white glass or polyester reinforcing mesh.

PART 3 - EXECUTION

3.1 HIGH TEMPERATURE VESSELS (FIBERGLASS)

A. Apply a first layer of insulating board. Band the board on immediately after application, using bands on 12” centers, drawn tight and securely fastened.

B. Apply successive layers of insulation as specified for the first layer, with joints staggered. After insulation has been applied, finish with Childers CP-38 or Foster 30-80 vapor barrier coating reinforced with glass or polyester reinforcing mesh per manufacturer's recommendations. Provide a flood coat of Childers CP-10/11 or Foster 46-50 with Foster Mast a Fab polyester or Chil Glas #10 reinforcing mesh.

C. To insulate removable heads, provide two equal sections of heavy-gauge, galvanized sheet metal covers, angle reinforced and lined with insulation board. Make covers easily removable to allow free access to the heads for inspection, cleaning and dismantling. Provide suitable flanges on the sections with neoprene gaskets between them, permitting a tight seal when the two sections are bolted together. Fill the voids with glass fiber wall cavity insulation.

3.2 LOW TEMPERATURE VESSELS (CLOSED CELL)

A. Apply a layer of insulating board. Band the insulation on immediately after application, using bands on 12” centers, drawn tight and securely fastened.

B. To insulate removable heads, provide two equal sections of heavy-gauge, galvanized sheet metal covers, angle reinforced and lined with insulation board. Make covers easily removable to allow free access to the heads for inspection, cleaning and dismantling. Provide suitable flanges on the sections with neoprene gaskets between them, permitting a tight seal when the two sections are bolted together. Fill the voids with closed cell insulation.

C. Apply weather protective finish on closed cell insulation. Provide a minimum of three coats.

3.3 ALUMINUM JACKETING (Insulated vessels outdoors above grade)

A. Apply aluminum jacket on vessels according to manufacturer's recommendations using aluminum strapping and metal jacketing sealant to provide weather tight covering.

B. Aluminum jacketing is not considered as contributing to the vapor barrier or the insulation jacket. The vapor barrier must be sufficient in itself for this function.

C. Install straps on 12” centers.

3.4 VESSEL INSULATION REQUIREMENTS

A. Insulate all low and high temperature vessels located exterior (outside) of the building, including the following:
1. Air separators
2. Expansion Tanks
3. Chemical feeders
4. Chilled water system volume tanks
5. Insulation thickness shall match thickness of adjoining pipe insulation

B. Insulate all low temperature vessels located interior (inside of the building, including the following:
1. Air separators
2. Chemical feeders

3. Chilled water system volume tanks
4. Insulation thickness shall match thickness of adjoining pipe insulation

C. Insulate the following high temperature vessels located interior (inside the building).
1. Air Separators
2. Insulation thickness shall match thickness of adjoining pipe insulation

D. As indicated on the drawings

END OF SECTION

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install piping insulation, jackets, accessories and covering of specified materials. The insulation shall be used for high and low temperature piping applications including chilled water, heating water, refrigerant lines, condensate piping and make-up water.

1.2 QUALITY ASSURANCE

A. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation that is absolutely satisfactory in both function and appearance. Provide insulation in accordance with the specifications for each type of service and apply as recommended by the manufacturer and as specified.

B. An approved contractor for this work under this Division shall be:
1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that have served their owners satisfactorily for not less than 3 years.

C. All piping insulation used on the project inside the building must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50, as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements and bear the UL label.

D. Condensation on any insulated piping system is not acceptable.

E. Replace insulation damaged by either moisture or other means. Insulation that has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.

F. Where existing insulated piping, or other surfaces are tapped, remove existing insulation back to undamaged sections for hot surfaces or to nearest insulation stop for cold surfaces, and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

1.3 SUBMITTALS

A. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in General Requirements and obtain approval before beginning installation. Include product description, list of materials and thickness for each service and location and the manufacturer's installation instructions for each product.

B. Make a field application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with installation of the work.

1.4 RELATED WORK

A. Finishes. Painting and color-coding

B. Pipe Heat Tracing

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Glass fiber pipe insulation:
   1. Johns-Manville Micro-Lok AP-T
   2. Owens-Corning ASJ/SSL
   3. Knauf ASJ/SSL

B. Cellular Glass Insulation (Foamglass):
   1. Pittsburg Corning
   2. Cell-U-Foam

C. Rigid Foam Insulation:
   1. Kingsapan Tarec
   2. Dow Trymer
   3. Tarec Ecophen – Phenolic Foam

D. Aluminum Jacketing:
   1. ITW Lock-on (Childers)
   2. ITW Z-lock (Pabco)

E. Fiberglass reinforcing cloth mesh:
   1. Perma Glass Mesh
   2. Alpha Glass Mesh
   3. Childers Chil-Glas
   4 Foster Mast a Fab
   5. Vimasco

F. Mastics, Sealants, Coatings and Adhesives
   1. Childers
   2. Foster
   3. Vimasco
   4. Armacell 520 Adhesive

G. Elastomeric Insulation
   1. Armacell

H. Weather Resistant Coating
   1. WB Armaflex Finish
   2 Foster 30-64

I. Glass fiber blanket insulation
   1. Manville R-series Microlite FSKL
   2. Owens-Corning eD75 or ED100 RKF
   3. Knauf 0.75 PCF FSK

2.2 RIGID FOAM PIPE INSULATION

A. Polyisocyanurate pipe insulation or phenolic foam pipe insulation, with all service reinforced vapor barrier jacket having integral laminated vapor barrier.
   1. Polyisocyanurate: Thermal conductivity 0.14 @ 75°F mean (ASTM C518).
   2. Phenolic Foam: Thermal conductivity 0.13 @ 75°F mean (ASTM C 518); minimum 2.5# density.
   3. Polyisocyanurate is not to be used inside of buildings without 25/50 rating.

2.3 FIBERGLASS PIPE INSULATION

A. Heavy density, dual temperature fiberglass insulation with factory applied, all service, reinforced vapor barrier jacket having integral laminated vapor barrier. Provide with a factory applied pressure sensitive tape closure system and matching butt strips. Supply in thickness as shown.
   1. Thermal conductivity 0.23 @ 75°F mean (ASTM 335).

2.4 ELASTOMERIC INSULATION

A. Insulation material shall be flexible, closed-cell elastomeric insulation in tubular or sheet form. Material shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, latest revision. Sheet material with a thickness greater than ¾" shall have a flame spread rating of 25 or less and a smoke developed rating of 100 or less when tested in accordance with ASTM E84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, and the flame shall not be progressive. In addition, all materials shall pass simulated end-use fire test.
   1. Thermal conductivity 0.27 at 75°F mean (ASTM C177 or C518)

2.5 CELLULAR GLASS INSULATION

A. ASTM C552:
   1. "k" value of 0.35 @ 75°F ("ksi" value of 0.047 @ 24°C);
   2. 8.0 lb/cu.ft. (128 kg/cu.m.) density

2.6 INSULATION/SHIELD AT HANGERS

A. Field fabricated: Use 360° sections of rigid foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal covering at least half of the pipe circumference, and conforming to the schedule. Insulation shall extend at least 1" beyond metal shield on each end. When pipe is guided at top and bottom, metal shields shall cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide with respect to insulation with ½" aluminum bands (2) per shield.
   1. Sections of foam glass insulation may be used of the same outside diameter of the adjoining pipe insulation.
   2. Minimum thickness of foam glass insulation shall not be less than 1" thick.

B. Pipe saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter or more than 22". Provide 18 gauge through 4" pipe and 16-gauge 5" pipe and above.

2.7 SEALANT, ADHESIVE AND FINISH

A. Lap Adhesive. Provide Childers CP-82 or Foster 85-20 adhesive.

B. Vapor Barrier Finish:
   1. Indoors: Provide as insulation coating Childers CP-38 or Foster 30-80, white. Coating must meet MIL Spec C-19565C, Type II and be QPL Listed. Permeance shall be 0.013 perms or less at 43 mils dry. Tested at 100ºF and 90% RH per ASTM E96.
   2. Outdoors: Provide as insulation coating Childers Encacel X or Foster 60-90. Permeance shall be 0.03 perms or less at 30 mils dry. Tested at 100ºF and 90% RH per ASTM F 1249 and must be Hypalon rubber based.
   3. Underground: Provide Childers CP-22/24 or Foster 60-25/26 for fittings and areas. Pittwrap cannot be used.

C. Insulation Joint Sealant. Provide Childers CP-76 or Foster 95-50 vapor barrier sealant.

D. Metal Jacketing Sealant. Provide Childers CP-76 or Foster 95-44 metal jacketing sealant for all outdoor metal jacketing laps.

E. Lagging Adhesive. Provide Childers CP-50AMV1 or Foster 30-36.

F. Other products of equal quality will be acceptable only upon approval.

2.8 ALUMINUM JACKETING

A. Finish insulated piping outdoors with a smooth prefabricated Z-lock aluminum jacket 0.016" thick with factory applied 1 mil polyethylene/40 lb and Fab strap. Kraft moisture barrier.

B. Valves, Fittings and Flanges. For finishing valves, fittings, flanges and similar installations, provide

formed aluminum covers, 0.024” thick.

C. Straps and Seals. Provide ½” x 0.020 stainless steel strapping and seals for jackets and covers according to manufacturer's recommendations.

2.9 GLASS FIBER BLANKET INSULATION

A. Minimum density of 1.0 PCF, 2” thick, installed R value to be 6.0 or better at 75°F mean, facing of 0.35 mil foil reinforced with glass yarn mesh and laminated to 40 lbs fire resistant kraft.

PART 3 - EXECUTION

3.1 INTERIOR PIPING

A. Cover all hot water piping with glass fiber, heavy density, dual temperature pipe insulation with a vapor barrier jacket. Apply insulation to clean, dry pipes. Longitudinal seams shall be joined firmly together and sealed with self-sealing lap joints. Butt insulation joints firmly together and seal with a 3” wide ASJ butt strip seal. Longitudinal seams and butt strip laps shall be coated and sealed with CP-35 vapor barrier coating for chilled water piping applications.

B. Cover all chilled water piping with rigid foam insulation.
1. Adhere the vapor barrier jacket longitudinal seam with vapor barrier adhesive.
2. Cover all valves, fittings and flanges with factory made molded or field fabricated segments of pipe insulation of a thickness and material equal to the adjoining insulation. Adhere segments together with no voids, using CP-82 adhesive. Secure fitting insulation covers and segments in place with ½” wide glass filament tape.
3. Apply a tack coat of fitting mastic over the insulation and tape.
4. Neatly embed with 10 x 10 fiberglass cloth into the tack coat.
5. Apply mastic over the fiberglass cloth to a thickness where the fabric is not visible after completion.
6. Seal ends of pipe insulation with vapor barrier mastic at valves, flanges, fittings and every 21' on straight runs of piping. Mastic should extend on top of ASJ jacket, across the foam, down onto the pipe, making a complete seal.

C. Install hanger with protective shield, on the outside of all insulation.

D. Where domestic water pipes (1/2” & ¾” pipe sizes) are installed on trapeze type hangers, provide galvanized sheet metal protection shields at these locations. Place insulation jacket directly on hanger. Incompressible, load bearing insulation segments are not required.

E. Pipe Saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter. Provide 18-gauge through 4” pipe and 16-gauge for 5” pipe and above.

F. Seal ends of pipe for chilled water insulation with vapor barrier mastic at valves, flanges, fittings and every 21' on straight runs of piping. Mastic should extend on top of ASJ jacket, across the glass, down onto the pipe making a complete seal.

G. Apply a smooth flood coat of white lagging adhesive Foster 30-35 or Childers CP-35 over all exposed insulation within mechanical rooms.

H. Piping to be insulated as specified above:
1. Chilled water and heating water
2. Make-up water

3.2 REFRIGERANT AND CONDENSATE PIPING

A. Cover all pipe with elastomeric insulation by slitting tubular sections or sliding unslit sections over the open ends of piping or tubing. Seams and butt joints shall be adhered and sealed using Foster 85-75, Childers CP-82 or Armstrong 520 Adhesive.

B. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Foster 85-75, Childers CP-82 or 520 Adhesive.

C. Pipe Saddles: Formed galvanized sheets at each support point for insulated pipe, shaped to fit pipe, and covering bottom half of pipe. Length at saddle shall be not less than twice the insulation outside diameter.

D. Outdoor exposed piping shall be painted with two coats of either WB or SB Armaflex finish or Foster 30-64 elastomer foam coating. All seams shall be located on the lower half of the pipe.

E. Outdoor exposed piping after being sealed as noted above apply aluminum jacketing to protect piping insulation exposed to weather, from damage from sunlight, moisture, equipment maintenance, wind, and shall provide shielding from solar radiation. Adhesive Tape shall not be permitted.

3.3 PIPING OUTDOORS ABOVE GRADE

A. Insulate all water piping exterior of building above grade with rigid foam insulation and aluminum jacketing.

B. Adhere the vapor barrier jacket longitudinal seam with vapor barrier adhesive.

C. Cover all valves, fittings and flanges with factory made molded or field fabricated segments of pipe insulation of a thickness and material equal to the adjoining insulation. Adhere segments together with no voids, using Childers CP-82 or Foster 85-20 adhesive. Secure fitting insulation covers and segments in place with ½” wide glass filament tape.

D. Apply a tack coat of fitting vapor barrier coating over the insulation and tape.

E. Neatly embed with 10 x 10 fiberglass or polyester reinforcing mesh into the tack coat.

F. Apply coating over the fiberglass cloth to a thickness where the mesh is not visible after completion.

G. Seal ends of pipe insulation with vapor barrier coating at valves, flanges, fittings and every 21' on straight runs of piping. Mastic should extend on top of ASJ jacket, across the foam, down onto the pipe, making a complete seal.

H. Finish with aluminum jacketing as specified.

3.4 FLANGE, VALVE AND FITTING INSULATION

A. Cover valves and flanges with fabricated segments, fittings with two-piece factory molded fittings, and both of matching pipe insulation type and thickness equal to that of the adjoining pipe. Fittings and fabricated segments shall be securely held in place.
   1. Apply a tack coat of insulating coating/mastic to the insulated fitting to produce a smooth surface.
   2. After mastic is dry, apply a second coat of vapor barrier coating/mastic. Neatly embed with 10 x 10 fiberglass or polyester reinforcing mesh into the tack coat.
   3. Overlap coating/mastic and fiberglass/polyester reinforcing mesh by 2” on adjoining sections of pipe insulation.
   4. Apply a second coat of coating/mastic over the fiberglass/polyester reinforcing mesh to present a smooth surface.
   5. Apply coating/mastic to a wet film thickness of 3/64”.
   6. Fabric shall not be visible after completion.
   7. Vapor seal flanges, valves and fittings with Childers CP-38 or Foster 30-80. Coating must meet MIL Spec C-19565C, Type II and be QPL Listed. Permeance shall be 0.013 perms or less at 43 mils dry. Tested at 100ºF and 90% RH per ASTM E96.

B. PVC fitting covers are not acceptable.

3.5 ALUMINUM JACKETING (Insulated Piping Outdoors Above Grade)

A. Apply smooth aluminum jacket on piping, valves, fittings and flange covers according to manufacturer's recommendations, using stainless steel strapping and seals, to provide weather tight covering and to shed water.

B. Aluminum jacketing is not considered as contributing to the vapor barrier or the insulation jacket. The vapor barrier must be sufficient in itself for this function. Lap each adjoining jacket section a minimum of 3” to make a weather tight seal with the application of 1/8” bead of Childers CP-76 or Foster 95-44 metal jacketing sealant.

C. Install straps on 9” centers and at each circumferential lap joint.

D. Cover and seal all exposed surfaces.

E. The use of screws and rivets is not approved.

F. Provide isolation (30# felt) between the aluminum jacket and the sheetmetal protection shield at each pipe support point.

3.7 MISCELLANEOUS

A. Insulate pumps with closed cell rigid board insulation as specified above.

B. Install materials after piping has been tested and approved.

C. Apply insulation on clean, dry surfaces only.

D. Apply weather protective finish on elastomeric insulation installed in non-conditioned spaces. Provide a minimum of three coats.

3.8 INSULATION THICKNESS

INSULATED UNIT	THICKNESS (Inches)
Refrigerant Piping	1-1/2
Chilled Water Piping (through 2” pipe)	1-1/2
Chilled Water Piping (2-1/2” pipe and Larger)	2
Condensate Drains	1
Heating Water Piping 2” Pipe and Larger	2
Heating Water Piping 1-1/2” Pipe and Smaller	1-1/2
Exterior Chilled and Hot Water Piping, 5” Pipe and Larger	2
Exterior Chilled and Hot Water Piping 4” Pipe and Smaller	1-1/2

END OF SECTION

SECTION 23 08 00

MECHANICAL COMMISSIONING COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section outlines commissioning requirements and activities of Contractor, Owner, CxA and Design Professionals as related to the Division 23 Mechanical.

B. Related Sections:
1. Division 01 – General Requirements and Specification Section 01 91 13, General Commissioning
2. Division 22 – Plumbing
3. Division 23 – Mechanical
4. Division 26 – Electrical

1.2 DEFINITIONS

A. Refer to Specification Section 01 91 13, General Commissioning for definitions.

1.3 CONTACT INFORMATION

A. The Owner will contract directly for commissioning services.
1. Commissioning Agent fee will be paid for directly by the owner.
2. Cost of contractor coordination with the CxA is specified in this section.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Contractor shall provide all standard and specialized testing equipment required to perform Start-up and Functional Performance Testing. Test equipment required for Functional Performance Testing including, but not limited to equipment listed below. Data logging equipment and software required to test equipment shall be provided by the Contractor.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 1.0ºF and a resolution of + or - 0.2ºF). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

C. Test equipment includes:
1. Air flow measuring devices (hoods, anemometers, etc.)
2. Water flow measuring devices
3. Temperature measuring devices (air and water)
4. Humidity sensors
5. Pressure gauges (air and water)
6. CO2 sensors

2.2 OTHER CONTRACTOR PROVIDED EQUIPMENT

A. Ladders and/or lifts and appropriate fall protection as required by Contractor site requirements.

PART 3 - EXECUTION

3.1 COORDINATION - GENERAL

A. Except for the activities to be performed by the CxA called for herein, all component and system installation work required by the Division 22, 23 and 26 specifications including specific contractor furnished items indicated by this Section shall be provided by the Contractor.

3.2 SUBMITTALS

A. Mechanical
1. Ductwork Layouts
2. Piping Layouts
3. Equipment Room Layouts
4. Mechanical Equipment as needed

3.3 EQUIPMENT START-UP

A. Notification
1. Contractor shall provide ten Owner business days' notice to CxA, Owner and Design Team of start-up dates.

B. Prior to start-up, contractor shall:
1. Verify that equipment and systems are complete, accessible, correctly connected to utilities and ready for operation. Perform all pre-start inspections and tests as called for in Division 23.
2. Comply with pre-start requirements of manufacturer and complete applicable documentation.
3. Complete applicable sections of Prefunctional Checklists.
4. Coordinate start-up attendance by manufacturer or authorized representative as required by specifications or manufacturer.

C. At start-up, contractor shall:
1. Supervise the activities of the authorized start-up technician or manufacturer's representative.
2. Verify proper voltage, phase, overcurrent protection, drive rotation and any other conditions that may cause damage if not correct.
3. Execute start-up under supervision of qualified contractor and equipment manufacturer personnel and in accordance with the manufacturer's instruction.
4. Complete manufacturer start-up requirements and documentation. Provide a copy of documentation to the CxA for inclusion in the Cx Manual.
5. Complete PFC's and provide documentation to CxA.
6. Provide documentation of any issues noted during start-up to CxA, Owner and Design Team. Outline recommendations for corrective action.

3.4 PIPE AND DUCT PRESSURE/LEAKAGE TESTING

A. General
1. The following procedures are meant as general procedures and do not alleviate Contractor of more stringent procedures specified elsewhere in Division 23.

B. Notification
1. Contractor shall provide adequate notice to CxA, Owner and Design Team of testing dates.

C. Duct Pressure Testing:
1. Prior to testing, contractor shall:
a. Select duct sections with approval by Design Team.
b. Calculate duct areas and acceptable leakage rates.
c. Verify that test equipment is of appropriate capacity for duct sections tested. Ideally, the pressure testing equipment will be at the midpoint of the system tested.
d. Verify that test equipment has been calibrated with NIST traceable certificates within the past 12 months or shorter time span if specified elsewhere in Division 23.
e. Isolate and seal duct sections.
2. During testing, contractor shall:

a. Conduct testing in a safe manner.
b. Operate test equipment at a minimum of 3” wg for ductwork between AHU and terminal unit, or as specified elsewhere in Division 23.
c. Operate test equipment at a minimum of 2” wg for ductwork downstream of terminal units and exhaust ductwork, or as specified elsewhere in Division 23.
d. Record all applicable test data.

3. Upon completion of testing, contractor shall:
a. Remedy sections that do not pass and schedule a retest.
b. Submit test results to Owner, Design Team and CxA for review.

D. Pipe Pressure Testing
1. Prior to testing, contractor shall:
a. Verify that test equipment has been calibrated with NIST traceable certificates within the past 12 months or shorter time span if specified elsewhere in Division 23.
b. Isolate and seal pipe sections to be tested.
c. Isolate equipment or apparatus connected to the piping system that may be damaged during the testing.
d. Clean and flush piping sections and fill with clean water, venting all air.
e. Allow adequate time for water and piping to reach ambient temperature.

2. During testing:
a. Maintain a safe condition in the area surrounding the test system.
b. Pressurize piping to 150% of design working pressure, but not greater than piping design pressure.
c. Pipe shall hold pressure for minimum of 2 hours.
d. Record temperature of piping and ambient air at beginning and end of test.
e. Record pressure on piping system at beginning and end of test.

3. Upon completion of testing, contractor shall:
a. Remedy sections that do not pass and schedule a retest.
b. Submit test results to Owner, Design Team and CxA for review.

3.5 PRE-FUNCTIONAL CHECKLISTS

A. Contractor shall forward completed copies of PFCs to the CxA for inclusion into the Cx documentation. PFCs will be provided by the CxA. As an alternate, contractor shall submit their versions of the PFCs to the CxA for review and comment.

B. Contractor shall complete PFC for each of the following equipment:
1. Mechanical:
a. Air Handling Units
b. Energy Recovery Units
c. Terminal Units
d. Pumps
e. Fans
f. Heaters
g. Split Systems
h. Heat Exchanger/Converter
i. Chiller
j. Boiler
k. Valves

3.6 TEST AND BALANCE

A. Contractor shall forward the T&B Execution Plan to the CxA prior to performing the field T&B activities. CxA will review and comment on Plan.

B. Contractor shall notify CxA a minimum of three (3) days prior to conducting field T&B activities. Failure to provide CxA with adequate notification may result in additional field time by T&B Contractor to demonstrate T&B results.

C. Key T&B activities that CxA requires notification on:
1. Terminal Units.

2. Air Handling Unit.
3. Energy Recovery Unit.
4. Heat Exchanger/Converter.
5. Pumps.

3.7 FUNCTIONAL TESTING

A. General
1. Contractor shall organize and schedule Construction Team members to execute the functional testing, which will be directed by CxA. Construction Team members may include Mechanical Sub, T&B Sub, Controls Sub, Electrical Sub, Fire Alarm Sub or Plumbing Sub. Contractor shall note that certain activities, such as sensor calibration, can be organized so that the T&B Sub is scheduled efficiently.

C. Air Cooled Chillers
1. Graphics
2. Start/Stop/Schedule
3. Compressor Operation (On/Off/Hand/Auto)
4. Entering/Leaving Temperature
5. Safeties
6. Alarms
7. Temperature Reset Sequences

D. Boilers
1. Graphics
2. Start/Stop/Schedule
3. Firing Operation (On/Off/Hand/Auto)
4. Entering/Leaving Temperature
5. Safeties
6. Alarms
7. Temperature Reset Sequences

E. Air Handling Units
1. Graphics
2. Start/Stop/Schedule
3. Fan Operation (On/Off/Hand/Auto)
4. Temperature Calibration (Air/Water)
5. Damper Positions (Off/On/Safety)
6. Valve Positions (Off/On/Safety)
7. Safeties (Low Limit/Smoke Detectors/Fire Alarm/Static Pressure)
8. Alarms (Filter/Temperature/etc.)
9. Damper Operation (Normal/Economizer)
10. Valve Operation (Normal Heating & Cooling/Economizer)
11. Fan Speed Control (VFD)
12. Temperature Reset Sequences
13. Static Reset Sequences

F. Energy Recovery Units
1. Graphics
2. Start/Stop/Schedule
3. Fan Operation (On/Off/Hand/Auto)
4. Temperature Calibration (Air/Water)
5. Air Flow Station Calibration
6. Damper Positions (Off/On/Safety)
7. Valve Positions (Off/On/Safety)
8. Safeties (Low Limit/Smoke Detectors/Fire Alarm/Static Pressure)
9. Alarms (Filter/Temperature/etc.)
10. Damper Operation (Normal/Economizer)
11. Valve Operation (Normal Heating & Cooling/Economizer)
12. Fan Speed Control (VFD)
13. Temperature Reset Sequences

14. Static Reset Sequences

G. Terminal Units
1. Graphics
2. Start/Stop/Schedule
3. Fan Operation (On/Off/Hand/Auto)
4. Temperature Calibration (Air/Water)
5. Thermostat Operation
6. Damper Positions (Off/On/Safety)
7. Valve Positions (Off/On/Safety)
8. Safeties (Smoke Detectors/Fire Alarm)
9. Alarms (Temperature/etc.)
10. Unoccupied Overrides

H. Pumps
1. Graphics
2. Start/Stop/Schedule
3. Pump Operation (On/Off/Hand/Auto)
4. Flow Station Calibration
5. Pressure Sensor Calibration
6. Pump Speed Control (VFD)
7. Sequencing and Alarms

I. Fans
1. Graphics
2. Start/Stop/Schedule
3. Thermostat Operation
4. Flow Station Calibration
5. Pressure Sensor Calibration
6. Speed Control (VFD)
7. Sequencing and Alarms

J. Heaters
1. Graphics
2. Start/Stop/Schedule
3. Thermostat Operation
4. Flow Station Calibration
5. Sequencing and Alarms

K. Split Systems
1. Graphics
2. Start/Stop/Schedule
3. Fan Operation (On/Off/Hand/Auto)
4. Temperature Calibration
5. Thermostat Operation
6. Safeties (Low Limit/Smoke Detectors/Fire Alarm/Static Pressure)
7. Alarms (Filter/Temperature/etc.)
8. Fan Speed Control (VFD)

L. Recirculation Pump
1. Graphics
2. Start/Stop/Schedule
3. Pump Operation (On/Off/Hand/Auto)
4. Temperature Sensor Calibration

3.8 TREND DATA

A. Contractor shall enable trend data as indicated herein and as specified by contract documents and Owner’s requirements. Trends shall be stored to a repository device that can be recalled at any time period. Sampling rate shall vary based upon the trend and may range from change of value (COV) to a maximum of 15 minutes.

B. Ambient (Outdoor) Conditions
   1. Dry Bulb Temperature
   2. Wet Bulb Temperature
   3. CO2 Level

C. Building Loop Chilled Water System
   1. Chilled Water Flow.
   2. Chilled Water Supply Temperature.
   3. Chilled Water Return Temperature.
   4. Chilled Water Pressure Differential.
   5. Chilled Water Pressure Setpoint.
   6. Pump 1 Speed.
   7. Pump 2 Speed.

D. Building Loop Hot Water System
   1. Hot Water Flow.
   2. Hot Water Supply Temperature.
   3. Hot Water Return Temperature.
   4. Hot Water Pressure Differential.
   5. Hot Water Pressure Setpoint.
   6. Pump 1 Speed.
   7. Pump 2 Speed.

E. Air Handling Unit Supply Air
   1. Supply Air Temperature.
   2. Supply Air Temperature Setpoint.
   3. Mixed Air Temperature.
   4. Mixed Air Temperature Setpoint.
   5. Chilled Water Valve Position.
   6. Hot Water Valve Position.
   7. Critical Terminal Unit Air Valve and Heating Position

F. Air Handling Unit Static Pressure
   1. Duct Static Pressure.
   2. Duct Static Pressure Setpoint.
   3. Fan Speed
   4. Critical Terminal Unit Air Valve Position

G. Air Handling Unit Economizer
   1. Supply Air Temperature.
   2. Supply Air Temperature Setpoint.
   3. Mixed Air Temperature.
   4. Mixed Air Temperature Setpoint.
   5. Return Air Temperature.
   6. Return Air Enthalpy.
   7. Outside Air Temperature.
   8. Outside Air Enthalpy.
   9. Chilled Water Valve Position.
   10. Hot Water Valve Position.
   11. Return Damper Position
   12. Relief Damper Position
   13. Outside Air Damper Position

H. Terminal Units
   1. Room Temperature.
   2. Room Temperature Setpoint.
   3. Supply Air Temperature.
   4. Inlet Air Flow.
   5. Inlet Air Valve Position.
   6. Heating Coil Valve Position.
   7. Fan Status.

8. Room CO2.

I. Split System Units
1. Room Temperature.
2. Room Temperature Setpoint.
3. Supply Air Temperature.
4. Fan Status.
5. Cooling/Heating Mode.

J. Fans
1. Room Temperature.
2. Room Temperature Setpoint.
3. Fan Status/Speed.

K. Heaters
1. Room Temperature.
2. Room Temperature Setpoint.
3. Status.

END OF SECTION

SECTION 23 09 33

BUILDING MANAGEMENT AND CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. A new Building Management and Control System (BMCS) shall be provided for the building additions and the existing Building Management and Control System in the existing fieldhouse shall be removed and replaced in its entirety including the implementation of all new sequences here within. Provide and install a complete high speed, peer to peer network Building Management and Control System (BMCS), including web-based operator interface, industrial instrumentation necessary to obtain functions and results specified. A complete system includes items such as sensors, valves, dampers, valve and damper operators, DDC panels, relays, terminal equipment controllers, mounting brackets and thermowell, etc. Integrate all components to provide a complete and functioning system.

B. Temperature Control System components:
   1. Electronic instruments as specified
   2. Electric instruments as specified
   3. Microcomputer instruments as specified

C. All control devices of the same type product shall be of a single manufacturer.

D. Control, power and interlock wiring necessary to accomplish sequences specified in this Section shall be provided and installed by the Control Subcontractor. Materials and methods of execution as specified in Division 26, Electrical.
   1. Coordinate current characteristics of all electrical instruments and equipment with Division 26 of the specifications and related electrical drawings.

E. The entire Building Management and Control System (BMCS) shall be installed by the Automation System Manufacturer or Authorized Distributor.
   1. All components and elements
   2. The testing and acceptance procedure

F. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

G. The entire Building Management and Control System (BMCS) shall be installed, Commissioned, and tested; all performed by the Automation System Manufacturer or Authorized Distributor if approved by engineer.
   1. All components and elements.
   2. Start-up and point verification.
   3. The testing and acceptance procedure.

1.2 RELATED WORK

A. Division 23, Mechanical

B. Division 26, Electrical

1.3 SUBMITTALS

A. Submit items of the Building Management and Control System (BMCS).
   1. Temperature control equipment & Field devices.
   2. Wiring & Flow diagrams.
   3. Sequence of operation.
   4. Complete, detailed, control and interlock-wiring diagram.

5. Indicate mechanical and electrical equipment furnished and electrical interlocks, indicating terminal designation of equipment. Respective equipment manufacturers shall furnish through the Mechanical Contractor, approved drawings of equipment to be incorporated in this diagram.
6. Submit Input / Output summary of all points.
7. Submit an outline of testing procedures from section Testing and Acceptance.
8. Mark up a copy of the specifications for the product. Indicate in the margin of each paragraph the following: “Comply, “Do Not Comply”, or “Not Applicable”. Explain all “Do Not Comply” statements.
9. Submit sample of space temperature sensor and guards for review prior to purchase or installation.

1.4 COOPERATION WITH OTHER TRADES

A. Furnish control valves, temperature sensing element wells, flow and pressure sensing devices, dampers and other similar devices to the Mechanical Contractor in a timely manner for installation under the Building Management and Control System (BMCS), Subcontractor's supervision.

1.5 METERING AND VERIFICATION REQUIREMENTS

A. Granular data, derived from the BMCS and inherent to this specification, is to be handled in such a way as to support extraction of data by owner for their use. Granular data is defined as temperatures, set points, run times and utility monitoring. All data is to be monitored on a fifteen-minute interval basis and stored in the BAS database. The BAS must have the inherent capability to trend, single point and multipoint, and display all information as described below.

B. Monitoring software must include outside environmental condition data which affect building performance. Heating degree days and cooling degree days must be logged and formatted in such a way that the data may be used for comparative analysis of multiple facilities, this facility and any district facility on a historical basis over time. This data must be imported from a reliable, certified, third party source. On site instrumentation is not acceptable.

C. Metering and Verification requirements must be inherent to the BMCS. It cannot be a “bolt on” product. It shall be of no extra cost to the project. It shall be easily accessible from the graphical interface on the main screens. It shall also be accessible from the BMCS navigation tree. Data must be retrieved and stored in the BMCS module until it is archived on the BMCS server. Data acquisition and storage must continue even if communication to the facility is lost. Data for utility consumption and environmental indexing must be stored on the server for a minimum of two years.

D. All data described in this section shall be easily extractable, without external software or programming, for use by the owner.

E. All data obtained by the BMCS shall be stored within the system and contain no less than 24 months of data that is easily accessible through the BMCS user interface.

1.6 WARRANTY

A. Provide with a manufacturer’s parts and labor warranty for a period of two years from substantial completion. Warranty shall also include unlimited telephone technical support, sequence and graphical modifications. Through warranty period and at the end of warranty period firmware, software and front end shall be updated to be the most current version available.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Automated Logic Controls by Automated Logic Branch Office

B. Reliable by Unify Energy Solutions

C. Trane by Hunton Trane

D. Distech Controls by TDI

2.2 SYSTEM ARCHITECTURE

A. The Building Management and Control System (BMCS) shall consist of an information-sharing network of stand-alone Direct Digital Control Panels (DDCP) to monitor and control equipment as specified of the control sequence and input/output summary.

B. "Information sharing" shall be defined as: The function of each DDCP to exchange data on the network trunk with other DDCP's without the need for additional devices such as network managers, gateways or central computers.

C. "Stand-alone" shall be defined as: The function of each DDCP to independently monitor and control connected equipment through its own microcomputer.

2.3 COMMUNICATIONS PROCESSING

A. The BMCS shall operate as a true token-pass peer-to-peer communication network. Resident processors in each DDCP shall provide for full exchange of system data between other DDCP's on the network trunk. Systems that limit data exchange to a defined number of system points are not acceptable.

B. Systems that operate via polled response or other types of protocols that rely on a central processor or similar device to manage DDCP to DDCP communications may be considered only if a similar device is provided as a stand-by. Upon a failure of malfunction of the primary device, the stand-by shall automatically, without any operator intervention, assume all BMCS network management activities.

C. The failure of any DDCP on the network shall not affect the operation of other DDCP's. All DDCP failure shall be annunciated.

D. Network shall support a minimum communications speed of 115.2 Kbps.

E. The network shall support a minimum of 100 DDC controllers and PC workstations.

F. Each PC workstation shall support a minimum of 4 peer-to-peer networks, by hardwired connection.

G. The system shall support integration of third party systems (fire alarm, security, lighting, PCL, chiller, boiler) via panel mounted open protocol processor. This processor shall exchange data between the two systems for inter-process control. All exchange points shall have full system functionality as specified herein for hardwired points. Provide examples of 5 reference projects utilizing gateways required for this project.

H. The system shall report values with a minimum end to end accuracy as listed in the following reporting accuracy table.

REPORTING ACCURACY	
Measured Variable	Reported Accuracy
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Dew Point	±1.5ºC (±3ºF)
Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15ºC (±0.25ºF)
Relative Humidity	±3% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale

Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO 2)	±50 ppm

Note 1: 10% - 100% of scale
Note 2: For both absolute and differential pressure
Note 3: Not including utility-supplied meters

I. The system shall facilitate controls loops to maintain measured variables at a set point within the tolerances listed in the following control stability and accuracy table.

CONTROL STABILITY AND ACCURANCY		
Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0-1.5 kPa (0-6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1-150 psi) 0-12.5 kPa (0-50 in. w.g.) differential

2.4 DDCP HARDWARE

A. Each DDCP shall consist of a 32-bit microprocessor and controller, power supply, input / output boards and communication board. All program and point databases shall be stored in battery-backed RAM. Provide a minimum of 1.2 MEG RAM in each DDCP to allow for point expansion and trend data storage.

B. Each DDCP shall incorporate a real-time clock.

C. Each DDCP shall be provided with two RS232 communications port. Connecting an operator terminal, whether portable or stationery, shall allow the user to communicate with the entire network.

D. Each DDCP shall provide for input / output connections to field equipment. The following point types shall be supported:
1. Analog inputs - for measuring sensed variables. Inputs shall be capable of accepting voltage, resistance, current or pressure signals.
2. Analog outputs - for controlling end devices. Outputs shall be capable of producing voltage, resistance, current or pressure signals. Outputs shall be provided with a manual override for adjusting outputs in the event of a power loss at the DDCP.
3. Digital inputs - for monitoring dry contacts such as relays, switches, pulses, etc.
4. Digital outputs - to control two position devices such as starters, actuators, relays, etc.

E. Each DDCP shall be listed under UL916 (Energy Management Systems), and shall be tested to comply with sub-part J of Part 15 FCC rules for Class A computing equipment.

F. Each DDC Controller shall have sufficient memory to support its own operating system and databases, including:
1. Control processes
2. Energy management applications
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified
5. Maintenance support applications
6. Custom processes
7. Operator I/O
8. Dial-up communications
9. Manual override monitoring

G. Operator shall have the ability to manually override automatic or centrally executed commands at the DDC Controller via local, point discrete, on-board hand/off/auto operator override switches for digital control type points and gradual switches for analog control type points.
1. Switches shall be mounted either within the DDC Controllers key-accessed enclosure, or externally mounted with each switch keyed to prevent unauthorized overrides.
2. DDC Controllers shall monitor the status of all overrides and inform the operator that automatic control has been inhibited. DDC Controllers shall also collect override activity information for reports.
3. All BMCS control modules shall have Hand Off Auto (HOA) switches on all outputs for HVAC and electrical, including digital outputs.

H. DDC Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Graduated intensity LEDs or analog indication of value shall also be provided for each analog output. Status indication shall be visible without opening the panel door.

I. In the event of the loss of normal power, there shall be an orderly shutdown of all DDC Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
1. Upon restoration of normal power, the DDC Controller shall automatically resume full operation without manual intervention.
2. Should DDC Controller memory be lost for any reason, the user shall have the capability of reloading the DDC Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.
3. Upon restoration of normal power, the DDC Controller shall automatically resume full operation without manual intervention.

J. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports.

K. Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

L. Each Building Controller and Advanced Applications Controller shall retain BIOS and application programming for at least 72 hours in the event of power loss.

M. Each Application Specific Controller shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

N. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

O. Controller Environment
1. Controller hardware shall be suitable for anticipated ambient conditions.
2. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof

enclosures and shall be rated for operation at - 29°C to 60°C (-20°F to 140°F).

3. Controllers used in conditioned space shall be mounted in dust- protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

2.5 PROGRAMMING FUNCTIONS

A. Resident software in each DDCP shall provide custom programming of control strategies.
   1. Point database
   2. Operator interface
   3. Network communications
   4. Facilities and energy management functions

B. Programming of control and energy management strategies shall be accomplished via a high-level computer language such as BASIC, JC BASIC, C, or Powers Process Control Language. A standard math processor shall be part of the programming language. All analog loops shall be capable of proportional, integral and derivative control.

C. Each DDCP shall incorporate an operator interface program (OIP) that provides an English language user interface. The OIP shall allow the user to program, interrogate, command and edit the BMCS via a self-prompting method. Operator terminals, whether textual or graphical, shall be able to access the entire network from any DDCP. Access shall be accomplished in a transparent fashion; that is, the operator shall not be required to address specific DDCP's in order to display or command system points.

2.6 FACILITY MANAGEMENT SOFTWARE

A. The BMCS shall be provided with standard and custom report generation functions that include:
   1. Alarm summaries
   2. Motor status summaries
   3. Point displays by type, system, status, overrides, failures, location, equipment and enabled/disabled.
   4. Program listings

B. All reports shall be either displayed or printed by:
   1. Operator request.
   2. Time of day.
   3. Event conditions (such as in response to an alarm, interlock, etc.).

C. All reports shall be time and date stamped.

D. An alarm-processing program shall be provided to annunciate those points designated as alarmable. Alarm points shall, upon alarm occurrence, be displayed and annunciated. An object that goes into alarm shall be annunciated at the workstation within 15 sec. Each workstation on the network shall receive alarms within 5 seconds of other workstations.

E. Historical trend data shall be collected and stored at each DDCP for later retrieval. Retrieval shall be manual or automatic. Any point, physical or calculated, may be designated for trending. The system shall allow for two methods of trend collection: Either by a pre-defined time interval sample or upon a pre-defined change of value. Trend data shall be presented in a columnar format. Each sample shall be timed stamped. Trend reports may be a single point or may be a group of points, up to a maximum of (8) points in any single group. Any point, regardless of physical location in the system may become part of a multiple point group.

F. Each BMCS network shall provide a point-monitoring function that can display single or multiple points in a continuous updated fashion for dynamic displays of point values.

G. A database and configuration report program shall be provided that allows the user to interrogate BMCS status. As a minimum, the user shall be able to: Verify available RAM at each DDCP, verify DDCP status (on-line, off-line, and failed) and set the system clock.

H. Any invalid operator entry shall result in an error message.

I. DDCP's shall contain a password access routine that will assign an operator to one of three level of access. Level 1 shall permit display function only, level 2 shall additionally permit commanding of system points and level 3 shall additionally permit full program and database editing.

J. DDCP's shall provide for the accumulation of totalized values for the purposes of run-time or energy totalization. Totalized values may be displayed or printed automatically or by operator request.

2.7 ENERGY MANAGEMENT SOFTWARE

A. The BMCS shall be provided with an optimal start program such that the building may be divided into ten zones for optimum start. Warm-up and cool-down shall occur in sequence with succeeding zones starting only after the preceding zone has completed its warm-up or cool-down.
   1. The optimum start-up time of assigned equipment shall be determined based on a software calculation that takes into consideration outdoor air conditions, space conditions, and building thermal characteristics ("U" factor).
   2. The optimum start program shall control start-up of the cooling and heating equipment to achieve the target occupancy space temperature at the precise time of building occupancy.
   3. A built-In "learning" technique shall cause the BMCS to automatically adjust itself to the most affective time to start equipment based on historical data.

B. The BMCS shall be provided with an operator interactive time of day (TOD) program. TOD programming and modifying shall be accomplished in a calendar-like format that prompts the user in English language to specify month, year, day and time and associated point commands. It shall be possible to assign single points or groups of points to any on or off time. Appropriate time delays shall be provided to "stagger" on times.
   1. TOD shall incorporate a holiday and special day schedule capability, which will automatically bring up a pre-defined holiday or special day schedule of operation. Holidays or special days can be scheduled up to one year in advance.
   2. In addition to the time dependent two-state control, TOD also provides time dependent setpoint control. This control provides the capability to output assignable, proportional setpoint values in accordance with the time of day and day of week. This program shall be used to accomplish night setback, morning warm-up and normal daily operating setpoints of all control system loops controlled by the BMCS. As with the two-state control, time dependent setpoint control shall be subject to the holiday schedule. The setpoints desired shall be user definable at any operator terminal.
   3. The operator shall be capable of reading and/or altering all sorted data pertaining to time of day, day of week, on/off times, setpoint values, and holiday designation.
   4. The TOD program shall also provide an override function that allows the user to conveniently change a start or stop time for any point up to one week in advance. The override command shall be temporary. Once executed the TOD program shall revert to its original schedule.
   5. The TOD program shall interface with the optimal start program (OSP) such that stop times may be assigned by OSP.

C. Additional Program functions required are to be installed and programmed as requested by end user at no additional cost:
   1. Enthalpy optimization.
   2. Supply air reset.
   3. Hot water reset.
   4. Chilled water reset.
   5. Volumetric control.
   6. Dead band control. Install dual set points as requested by user.
   7. All specified energy management programs, whether or not applicable to this project shall be provided such that the owner may enable the program at a future date without the need to purchase additional software or modify existing software.

2.8 WEB SERVER ACCESSIBILITY

A. Industry leading encryption technology to provide accessibility through a web browser.

B. Building Manager's ability to access, view and command critical building information in real time over the intranet or internet.
   1. Alarm Display
   2. Point Commanding
   3. Graphic Display
   4. Scheduling
   5. Running Reports
   6. Point Details

C. Operators shall be able to perform all normal operator functions through the web browser interface. If individual software seat licenses or keys are required provide a minimum of 4 additional licenses to accommodate multiple owner operators.

D. Manufacturer shall provide a web-based BAS platform; the installing contractor shall provide the new web-based software and software updates required for this project. Additionally, the installing contractor shall provide all computer related components (BAS web server – reference specifications for hardware requirements) for the new software platform to function in a peer-to-peer environment.

2.9 REMOTE NOTIFICATION

A. Remote notification sends Alarm and System Event information to various notification devices as indicated below but not limited to. Operators can receive their building automation system alarms without restricting them to dedicated workstations.
   1. Alphanumeric pagers
   2. Numeric pagers
   3. Email
   4. Phones via voice or short message service (SMS)

2.10 POINT EXPANSION MODULES

A. Capable of extending its input/output capabilities via special purpose modules.
   1. Modules may be mounted remote from the DDCP.
   2. Shall communicate with the DDCP over a pair of twisted cables.
   3. Operator shall have the ability to manually override automatic or centrally executed commands at the DDC Controller via local, point discrete, on-board hand/off/auto operator override switches for digital control type points and gradual switches for analog control type points.
   4. All BMCS control modules shall have Hand Off Auto (HOA) switches on all outputs for HVAC and electrical, including digital outputs.

2.11 TERMINAL EQUIPMENT CONTROLLERS

A. Provide for control of each piece of equipment, including, but not limited to, the following:
   1. Variable Air Volume (VAV) boxes
   2. Constant Air Volume (CAV) boxes
   3. Dual Duct Terminal Boxes
   4. Unit Conditioners
   5. Heat Pumps
   6. Unit Ventilators
   7. Room Pressurization
   8. Fan Coil Units

B. Terminal unit controllers and damper actuators shall be separate and individually replaceable.

C. Include the following items:
   1. All input and outputs necessary to perform the specified control sequences.
      a. Analog outputs shall be industry standard signals such as 24V floating control.
   2. Sufficient memory to accommodate point database, operating programs, local alarming and local trending.
   3. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM, or minimum of 100-hour battery backup shall be provided.

4. Return to full normal operation without user intervention after a power outage of unlimited duration.
5. Operation programs shall be field selectable for specific applications.
6. Specific control strategy requirements, allowing for additional system flexibility.
7. Controllers that require factory changes of all applications are not acceptable.
8. The failure of any terminal equipment controllers on the network shall not affect the operation of other terminal equipment controllers and be capable of standalone operation. All terminal equipment controller failures shall be annunciated at the specified alarm pages.

2.12 ELECTRONIC DAMPER ACTUATORS

A. Two position damper operators:
   1. Spring return to full travel position.
   2. Built in auxiliary switches (motor end switches)
      a. Switch shall be fully adjustable so that cut-in/cut-out points may be preset at any point within angular travel of the motor.
   3. Minimum torque 60-in-lb

B. Modulating damper operators:
   1. Sized with sufficient reserve power to provide smooth modulating action and tight close off against the system pressure
   2. Select the operator with available torque to exceed the maximum required operating torque by not less than 100%
   3. Minimum torque 100 in-lb

C. Outside air damper actuators shall be interlocked such that damper operates in hand or auto via the starter. The damper end switch shall energize the unit to run only with end switch for fully open is signaled.

D. Outside air damper actuators to be spring return closed and end switches interlocked for start/stops.

E. Damper actuators shall not have integral controllers.

F. Dampers shall be provided with mechanical or electronic stall protection to prevent actuator damage throughout the actuators rotation.

G. Damper actuators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 60 in.-lb torque capacity shall have a manual crank.

2.13 CONTROL CABINETS

A. Fully enclosed NEMA 1 for indoors, NEMA 4 for outdoors.
   1. Powder coat painted on all sides
   2. Cabinet with continuously piano type hinged door
   3. Locking latch
   4. All locks shall use a common key
   5. Panels or termination panels must be identified with engraved nameplates.
   6. Provide enamel finish and extruded aluminum alloy frame UL 50 certified.
   7. Provide only 100VA Transformers with integral manual overload reset. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

B. Above each control cabinet provide a wire gutter that matches the width of the control cabinet. All control wiring shall pass through this wiring gutter. Provide each wire with a 3 foot long service loop located in wiring gutter.

C. Each control panel that are directly connected to the districts network and/or are master controllers shall be provided with a two (2) hour UPS. The UPS provided shall contain a Hot swappable battery. UPS shall be installed on the wall in a cabinet and not placed on the floor. The connection between the UPS and the line power shall include a manual disconnecting means for disconnecting the power to the

UPS and power to the panel to allow replacement of the UPS without turning off the incoming power.

D. Each plant controller shall be provided with an IP network controller and a dedicated network drop.

E. Each control panel shall have control power source power source (on-off) with overcurrent protection.

F. Each Air Handling unit shall be provided with a dedicated control transformer. Ensure all safeties related to each air handler are associated with the dedicated control transformer.

2.14 AUTOMATIC CONTROL VALVES

A. Pressure ratings: Minimum 125 psig or 1.25 times maximum system operating pressure.

B. Construction:
1. 2" and smaller:
   a. Screwed.
   b. Bodies and internal parts: Bronze, stainless steel or other approved corrosion-resistant metal.
2. 2-1/2" and larger:
   a. Flanged.
   b. Bodies: Cast iron or cast steel.
   c. Seats and parts exposed to fluid: Bronze, stainless steel or other approved corrosion-resistant metal.
3. Characterized port ball valves are acceptable for VAV terminal units only.

C. Modulating straight through water valves: Equal percentage contoured throttling plugs.

D. Three Way Mixing Valves: Linear throttling plugs allowing total flow through valve to remain constant regardless of position.

E. Sizes: By Automatic Control System Manufacturer for fully modulating operation.
1. Minimum pressure drop: Equal to pressure drop of coil or exchanger.
2. Maximum pressure drop: 5.5 psi.
3. Relief and bypass valves: Sized according to pressure available.
4. 2-position valves: Line size.
5. Manual by-pass operator.

F. Electronic Actuator:
1. Direct coupled installation
2. Visual and electronic stroke indicator
3. Die-cast aluminum housing
4. Manual override
5. Self-lubricating bearing and gear train
6. Automatic calibration
7. Automatic duty cycle protection
8. Overload and stall protection
9. Non-spring return
10. Floating /0-10 VAC / 4-20mA operation
11. UL approved
12. Provide smooth modulating action and tight close off against the system pressure.
13. Torque to exceed the maximum required operating torque by not less than 150%.
14. Actuator input signal shall be compatible with output DDC controller.
15. Provide weatherproof enclosure (exterior use).
16. Damper actuators not acceptable for valves.

2.15 FLOW DETECTION SWITCHES

A. Remote Flow Solid-State Flow Detection:
1. Extended length flow probe
2. Cabinet-mounted control monitor
3. Wetted parts, 316 stainless steel probe

4. Optional temperature and wire-break outputs
5. Flow and temperature switch points
6. LED bar graph display for status indication

B. Approved Manufacturer:
1. IFM Effector

2.16 DIFFERENTIAL PRESSURE SWITCHES

A. Wet/wet differential pressure switch
1. Integral Mounting Frame
2. Watertight, dust-tight, and corrosion resistant enclosure.
3. Wetted materials of brass and flouroelastomer.
4. Externally adjustable set point

B. Approved manufacturer:
1. Square D #9012GGW4
2. Dwyer #DXW-11-153-1
3. Carrier #HK06ZC033

2.17 TEMPERATURE LOW LIMIT SWITCH

A. Responsive to the coldest 1' section of its length.
1. Double pole single throw switch
2. 20' capillary
3. Line voltage with bellows actuated switch
4. Auto reset for outdoor installation
5. Manual reset for indoor installation
5. Refer to manufacturer's installation instructions for installation locations with limited duct access. Support material shall be rigid copper pipe.

2.18 TEMPERATURE AND HUMIDITY SENSORS

A. Space Temperature Sensors
1. Thermister with resistance of 10,000 ohms at 77°F.
2. Accuracy shall be +/-1/2°F.
3. Range of 55° to 95° F.
4. Surface Mounted (Cafeteria, Multipurpose and Library Only)
a. Digital temperature display
b. Setpoint slide adjustment
c. Override button
d. Communication port
e. Color to be approved by Architect / Owner, submit sample for review
5. Flush mounted (Remainder of building)
a. Stainless steel flush mount sensor, submit sample for review.
6. Location and height to be approved by Architect/Engineer prior to installation.
7. Provide guards impact resistant Polycarbonate equal to BAPI-Guard in the following locations:
a. Cafeteria
b. Multipurpose
c. Library
8. Provide an insulated sensor wall plate to fully cover wall opening. Back cover plate shall match sensor color.
9. Where indicated on drawings to provide both space temperature and space humidity, a combination temperature sensor shall be used but device shall still comply with characteristics described in each section of specification.

B. Space / Duct Humidity Sensor
1. Capacitance element in the space or duct as required and output a 4 to 20 MA signal proportional to 0 to 100% RH to the DDC.
2. Capacitance element shall be field replaceable and not require calibration.
3. Accuracy shall be +/-2% in the range from 20 to 95% RH.

4. Relative humidity sensors shall have the sensing element of inorganic resistance media.
5. Provide impact resistant Polycarbonate equal to BAPI-Guard covers suitable for institutional use. Submit sample for review.
6. Provide manufacturers calibration certificate.
7. Provide impact resistant Polycarbonate equal to BAPI-Guard guards in the following locations:
   a. Cafeteria
   b. Multipurpose
   c. Library
8. Provide an insulated sensor wall plate to fully cover wall opening. Back cover plate shall match sensor color.
9. Where indicated on drawings to provide both space temperature and space humidity, a combination temperature sensor shall be used but device shall still comply with characteristics described in each section of specification.

C. Duct Temperature Sensors
1. Range of 20° to 120°F.
2. Multi point sensing of temperature.
3. Averaging elements of sufficient length to sense temperature across the full face of the coil or 2/3 duct width, provide accurate, representative indication and control and prevent variances in temperature or stratification.
4. Probes with lengths greater than 3’ shall be externally supported to adjacent structures to prevent unwanted movement.
5. BAPI Rigid Averaging Temperature Sensor with steel junction box. (Note provided sensor shall satisfy the requirement to extend 2/3 across the entire airflow being measured.)
6. In general, and wherever possible, coil discharge temperatures shall be installed far enough downstream of the coil to avoid radiation effects to/from the coil as well as achieve mixing of air stream after it leaves the coil.
7. Zone reheat coil sensors shall be installed at least four feet downstream of the zone reheat coil. Cases where this is not possible or would result in sensor access issues shall be discussed with and approved by the Owner and Engineer.

D. Liquid Immersion Temperature Sensors
1. Platinum type resistance temperature detector (RTD).
2. Match sensor range to medium being monitored.
   a. Hot water range 30° to 250°F.
   b. Chilled Water 20° to 70°F.
3. Furnish stainless steel wells for installation by Mechanical Contractor.
4. Locate all sensors in field with Owner/Engineer present.
5. System accuracy for liquid temperature sensing shall be +/-1/2°.
6. Sensors must be removable from wells.

E. Outside Air Temperature and Humidity Sensor
1. Temperature
   a. Range of –40° to 140°F.
   b. Accuracy shall be +/-0.9°F
   c. Encapsulated into Type 304 stainless steel tubes with low conductivity moisture proofing material and lag extension for thickness of insulation.
2. Humidity
   a. Capacitance element in the space or duct as required and output a 4 to 20 MA signal proportional to 0 to 100% RH to the DDC.
   b. Accuracy shall be +/-2%
   c. Range from 20 to 95% RH.
   d. Relative humidity sensors shall have the sensing element of inorganic resistance media.
3. Weatherproof sun shield consisting of multiple white plastic plates to reduce the thermal effects of the sun and increasing air flow between the plates.
4. Sensor shall be mounted a minimum of 6” from all building structures.
5. Minimum of 8' long leads.
6. Provide manufacturers calibration certificate.
7. Provide with a 5-year warranty
8. Manufactured by ACI Model # A/-RH2-AN-O-SUN---NIST

F. Freezer / Cooler Sensors
1. Thermistor with resistance of 10,000 ohms at 77°F.
2. Accuracy shall be +/-1/2°F.
3. Range of -40°F to 210°F.
4. Provide manufacturers calibration certificate.
2. Die cast aluminum construction
3. Liquid tight wire connector to isolate sensor chamber from exterior temperature influence.
4. 1/2" NPT threaded hub
5. Mamac Systems Model #TE-205-F-12
6. Reuse existing wiring penetrations through cooler or freezer where possible. If existing penetrations through cooler or freezers cannot be reused, seal existing holes with silicone such that opening is airtight.
7. All new penetrations into the cooler or freezer body shall be sealed airtight using silicone. This shall include screw holes and wiring penetrations.

2.19 CURRENT SENSITIVE RELAYS

A. Ensure compatibility with VFD applications for variable speed motor status.
1. Provide with adjustable set point.
2. Relays must be mounted and not hung by power wires thru CT.
3. Provide fixed core current sensors for new wiring and split-core type current sensors for existing wiring.
4. Loop powered.
5. LED Status.
6. Acceptable Manufacturer: Veris Industries / Hawkeye
7. Relays shall close status contacts in response to current flow in power leads to the equipment being monitored.

2.20 DIFFERENTIAL PRESSURE TRANSDUCER

A. Transducers to convert differential pressures to 4-20 MA analog outputs.
1. Solid state pressure sensor with accuracy of +/- 1% of calibration range.
2. Factory calibrated and have zero and span trimmers for field calibration.
3. Range shall be selected to match the medium being monitored.
4. Pressure snubbers to protect from pressure pulses and a 3-way bypass / valve assembly to protect the transducer from overpressure damage during start-up.
5. LCD Display
5. NEMA 1 Enclosure
6. Acceptable Manufacturer: Rosemount 1151 or 3051 Pressure Transmitter

2.21 ELECTRIC REMOTE BULB THERMOSTAT

A. Two position remote bulb thermostat:
1. Bimetal controlled.
2. Sealed mercury switches.
3. Provide specified control action.
4. Adjustment can be made by removing unit cover.
5. Element with capillary length as required for the location.

2.22 ELECTRIC SPACE THERMOSTAT

A. Two position space thermostat.
1. Single Pole switch actuated by bi-metal sensing element.
2. Range shall be 60°F to 90°F.
3. Removable external knob adjustment means.

2.23 HIGH STATIC PRESSURE SWITCH

A. With manual reset switch
1. Approved manufacturer: Cleveland AFS-460.

2.24 INSERTION FLOW SENSORS

A. Electromagnetic Flow Meter
1. Retractable hot tap flow sensor
2. Accuracy: +/- 1% of full scale
3. Electromagnetic
4. Custom thread-o-let 400 psi / 250 degree F rated.
5. Line size from 1-1/4 to 72 inch
6. Metering range from 0.3 to 15 f/sec.
7. Remote NEMA 4 wall mounted LCD display
8. Field Pro Software & Communicator
9. Warranty two years
10. Approved Manufacturer Onicon Flow Meter F3500 or FT3500

2.25 CONTROL DAMPERS

A. Opposed blade dampers.
1. Frames of 13-gauge galvanized sheet metal.
2. Provisions for duct mounting.
3. Damper blades not exceeding 8" in width.
4. Blades of two sheets of 16-gauge galvanized sheet metal.
5. Blades suitable for high velocity performance.
6. Bearings of nylon or oil-impregnated, sinthered bronze.
7. Shafts of 1/2" zinc-plated steel
8. Leakage does not exceed 1/2% based on 2000 fpm and 4" static pressure.
9. Replaceable resilient seals along top, bottom and sides of frame and blade edge.
10. Submit leakage and flow characteristics data with shop drawings.
11. Linkage shall be exposed and out of the air stream.
12. Acceptable Model is Ruskin Model CD60.

2.26 PHOTO-CELL CONTROL

A. Light Sensitive Resistor.
1. 4-20 output or switch.
2. On = 3.0 / fc. Off 10.0 / fc.
3. UL Approved.

2.27 DRAIN PAN FLOAT SWITCH

A. Rated at 10 Amps.
1. Shuts off equipment if water level becomes too high.
2. DPDT Contacts.

2.28 BY-PASS AUTOMATIC SHUT-OFF TIMERS

A. Rated at 10 Amps, 125 VAC
1. Shuts off equipment with timed switch
2. White decorated timer
3. Without hold feature
4. Time Cycle 60 minutes

2.29 CO_2 SENSOR

A. Telaire Model T5100 CO_2/Temperature Sensor or approved equal
1. Local visual indication of CO_2 levels in enclosed spaces.
2. Pre-calibrated with factory default settings of 1000 ppm and 1500 ppm CO_2 levels
3. Bright LED indicator transitions between green, yellow, and red as the CO_2 threshold is exceeded.
a. Accuracy: +/- 30 ppm @ 72°F
b. Output: 0-10 V (100Ω output impedance) and NTC 20k Thermister

2.30 HVAC SHUTDOWN STATION

A. Shutdown Switch:
   1. White Mushroom Button within a clear plastic cover
   2. Latches when depressed
   3. Twist reset
   4. Labeled “HVAC SHUTDOWN”
   5. Manufactured by STI Model # SS2371HV-EN (Coordinate color with Owner)

2.31 EXTERIOR LIGHTING OVERIDE STATION

A. Override Button:
   1. Yellow Mushroom Button within a clear plastic cover
   2. Momentary contact configuration
   3. Labeled “EXTERIOR LIGHTING OVERIDE”
   4. Manufactured by STI Model # SS2234ZA-EN (Coordinate color with Owner)

2.32 INTERIOR LIGHTING OVERIDE STATION

A. Override Button:
   1. Yellow Mushroom Button within a clear plastic cover
   2. Momentary contact configuration
   3. Labeled “INTERIOR LIGHTING OVERIDE”
   4. Manufactured by STI Model # SS2234ZA-EN (Coordinate color with Owner)

PART 3 - EXECUTION

3.1 REPLACEMENT OF EXISTING BMCS SYSTEMS

A. Complete replacement of the existing Building Management and Control Systems shall include the following:
   1. Remove all existing control devices and replace with new.
   2. Remove all existing wiring and replace with new.
   3. Remove and replace all existing damper actuators.
   4. Remove and replace all terminal unit controllers.
   5. Remove and replace all existing BMCS control cabinets.
   6. Existing control conduits may be reused where not damaged or aged. Existing conduit shall be extended to new end device locations. All existing control conduit being abandoned shall be removed.
   7. New control wiring shall not be routed in the same conduit or pathway as any line voltage wiring.
   8. The owner shall be given first right of refusal on all existing control devices.
   9. Existing motorized dampers associated with all exhaust fans, outside air intakes, and relief vents shall be replaced with new unless otherwise noted in the project documents. It is the intent that all exhaust, relief, and intakes include a motorized damper. If a device is found not to have an existing damper or the damper is not functioning, notify the engineer/owner immediately.
   10. Line voltage wiring shall not be installed within controls cabinet. If line voltage is required a relay should be mounted in a separate enclosure or on the exterior of the controls cabinet.

B. The new BMCS system shall maintain control of all equipment and devices currently on the existing BMCS system. Contractor shall field verify all existing equipment and devices prior to bid.

C. It is the responsibility of the contractor to ensure all equipment is under control of a BMCS system prior to the building system being started and building becoming occupied. In instances where this is not possible, it is the responsibility of the contractor to monitor and maintain, within District standards, the operation of the equipment manually until the equipment is under automatic control. The Contractor shall field all hot and cold calls during construction.

D. Verify operation of all existing equipment prior to adding existing equipment to new control system. Notify engineer/owner of inoperable equipment.

E. Contractor is to maintain safety interlocks during all phases of the BMCS installation. This includes

providing temporary rough-ins of high static limits to VFD shut downs, freeze stat interlocks to starters/VFDs, etc. The wiring for these rough-ins may be run in a temporary fashion overhead, exposed and unsupported as long as the wiring is not in the path of the normal construction movement in the space. Wires laying on the floor and/or in the path of other workers in not acceptable at any time. These safeties are to be maintained until the AHUs controls are downloaded, commissioned, and operating in automatic mode per sequence of operations.

F. The new system shall be fully integrated with the existing Building Automation System Host server. BMCS shall provide and install any new hardware and provide additional licenses for new system.

3.2 INSTALLATION

A. The control system shall be installed and final adjustments made by full-time employees of the factory-approved BMCS Building Management Control Subcontractor.

B. The contractor shall collaborate through Architect / Engineer and Owner to determine the Owner's preference for naming conventions, etc. before entering the data in to the system.

C. Due to actual operational or space conditions, it may be necessary for the Contractor to make sequence of operation modifications and/or controller adjustments, change the location or type of sensor to obtain proper operation and coverage of the system in each room or space. These change, if requested by the Owner or Engineer, shall be performed at no additional cost to the Owner. Therefore labor allowances should be made for such changes and adjustments if requested.

D. Points listed within this section are to be connected to the BMCS system as hard-wired points to cards and not connected through BacNet integration. The BacNet interface is for read only points not included within sequences of this specification.

3.3 INTERLOCK AND SAFETY CIRCUITS

A. Close the outdoor air dampers when the related HVAC unit supply or exhaust fan is de-energized:
   1. The damper and actuators are specified in this section.
   2. Outdoor air damper shall be fully opened before related air handling unit fan is energized for 100% outside air use.
   3. Provide motorized outside air dampers for the following:
      a. Supply fans
      b. AHUs
      c. Exhaust fans (except kitchen exhaust)

B. Close the chilled and hot water valves to the coil when the related unit is de-energized.

C. Interlock each chiller to start its dedicated chilled.
   1. On shutdown provide a circuit to permit the chilled water pumps a to run while the chillers pump down as required by the manufacturer.
   2. As per manufacturer’s recommendations

D. Primary chilled water control:
   1. Operating and safety controls are furnished as an integral part of the water-chilling unit and not specified in this section.
   2. Provide a high limit temperature sensor in each primary chilled water pump loop.

E. Exhaust/Supply Fans:
   1. Interlock the related exhaust and supply fans and the related outside air damper.
   2. Interlock the exhaust fans with the related air-handling unit through software.
   3. Interlock related exhaust fan for dishwasher with time delay off relay.
   4. Interlock related exhaust fan for kiln with time delay off relay
   5. Interlock kitchen hood related supply and exhaust fans.
   6. Provide additional interlocks as indicated on fan schedule and on drawings.
   7. Interlock electrical and mechanical room exhaust fans with thermostat.

8. Interlock refrigerant monitor with mechanical room purge system.
9. Interlock science room related supply and exhaust fans.
10. Interlock outside air supply fans for VAV air-handling unit with air-handling unit status point.

F. Freeze Protection:
1. Provide a freeze protection sequence to ensure proper operation of equipment during a freeze condition not limited to the following:
   a. Outside Air Handling Units & Supply Fans with heating and cooling coils: If unit is in occupied or unoccupied mode, upon the triggering of software point indicating a freeze condition or the low temperature sensor (freeze stat) indicates a freeze condition, the system will be disabled, close the outside air damper, open both heating and cooling valves to enable full flow condition. If heating coil discharge air sensor indicates a failure to control and is below setpoint then enable software point indicating a freeze condition, disable unit, close outside air damper, and open both heating and cooling valves to enable full flow condition. Ensure HW & CHW pumps are operational.
   b. Boilers - Enable during a freeze condition.
   c. Chillers – Open isolation valves then command by-pass valve to dump water into basin or by-pass tower. Enable condenser water pumps during a freeze condition.
   d. Air Cooled Chillers – Open isolation valves, then enable pumps, run cycle for 15 minutes per hour, open all chilled water valves.
   e. Protect coils downstream of DX cooling coil with freeze protection. If unit is in occupied or unoccupied mode, upon the triggering of software point indicating a freeze condition or the low temperature sensor (freeze stat) indicates a freeze condition, the system will be disabled, close the outside air damper, disable the DX cooling coil. If coil discharge air sensor indicates a failure to control and is below setpoint then enable software point indicating a freeze condition.
2. Temperature low limit switch wired with double pole single throw switch with one switch leg hard-wired to de-energize fan and one switch leg to signal BMCS.

G. Drain Pan Float Protection:
1. Interlock to shut down unit and close valves.
2. Cooling Coils mounted above ceiling and in roof mounted units.
3. Provide for each cooling coil location.
4. Signal BMCS alarm point

H. Domestic Water System:
1. Interlock in-line circulating pumps at water heaters with return water pipe mounted thermostat to cycle pump with return water temperature.
2. Interlock high temperature entering water solenoid valve with thermostat on discharge side of tempered water mixing valves.
3. BMCS shall provide contactors/relays to allow scheduling of domestic water heaters and circulation pumps.

I. Copper Tube Boiler:
1. Interlock each boiler to start its dedicated primary circulating pump. Interlock flow switch and pump to boiler safety terminal strip.
2. On startup enable boiler and primary pump prior to starting secondary system pump until primary loop temperature reaches 105 degrees as per manufacturer’s recommendations.
3. Disable secondary pump if boiler goes into alarm or fails to produce heating water within 30 minutes.

J. Hydronic Heating Boiler:
1. Interlock each boiler to start its dedicated pump.
2. On startup enable boiler prior to starting primary pump. Boiler should reach operating temperature prior to starting system pump as per manufacturer’s recommendations.
3. Disable system pump if boiler goes into alarm or fails to produce heating water within 30 minutes.
4. Install communication cable between each boiler and master controller specified by boiler manufacturer.

K. HVAC Shutdown Station:
1. Provide an emergency mushroom style push / pull station shutdown switch in the Administration Area or as directed by Owner / Architect.
2. Signal the building automation system to de-energize the HVAC equipment.
3. This is to stop exhaust fans and outside air units immediately.
4. Other air handling units, chillers and equipment shall be shut down in an orderly manner so as to not damage the equipment.
5. Once stopped, the system may only be restarted with a key operated switch located adjacent to the shutdown switch.

3.4 GRAPHICS

A. Furnish as-built drawings indicating finally corrected "as installed" diagram(s) of the complete Building Management Control System.
1. Modification of existing control systems shall be included.
2. These must be as-built and any changes during the warranty period drawings must be revised and updated.
3. Provide final sequence of operation in written format.

B. Provide a set of the "as installed" diagram(s) of the complete control system laminated in plastic and hung in the main mechanical room or as directed by Owner.

C. Provide a color-coded floor plan of the building showing the location of each system, and the area served by each AHU or related zone. These must be of professional quality. Floor plan is to hang in main mechanical room near central control panel.

D. Provide computer graphics for each system.

E. Provide final graphic room numbers as selected by Owner / Architect.. Obtain a graphic submittal package for review. Construction Drawing room numbers are not to be used unless approved in writing.

F. Provide a global temperature override function in which every thermostat in the building can be lowered or raised a few degrees, adjustable. This function shall reside on central plant cooling page.

G. Values and Overrides in Graphics
1. All analog values, unless the value is always an integer value {for example # of cooling requests}, shall be displayed to the tenths place, with corresponding units (for example: 55.3 ºF, 75.3 %, etc.). Additionally, all values for display and override capability **shall conform to the following standard**: 0.0 % for fully closed or off, and 100.0 % for fully open or at full speed, as well as directly proportional for all values in between (any and all calculations, or conversions to account for direct acting vs. reversing acting, 2.0 volt to 10.0 volt, or any other variations shall be accounted for in the background such that the displayed value follows the above defined standard;
Example #1: a VFD set with a local minimum and maximum of 20.0 Hz and 60.0 Hz, respectively, shall display values of 0.0 % only for off, 33.3 % for 20.0 Hz, 66.7 % for 40.0 Hz, % for 60.0 Hz, etc.; conversely when an operator override is entered for 75.0 % speed, it shall take the VFD speed to 45.0 Hz {75.0 % x 60.0 Hz max};
Example #2: a reverse acting valve in which 10.0 volts is fully closed and 2.0 volts is fully open, shall display 0.0 % for 10.0 volts, 50.0 % for 6.0 volts, 0.0 % for 2.0 volts or less, etc.; conversely when an operator override is entered for 75.0 % it shall take the output to 4.0 volts {10.0 – 75.0 % x (10.0–2.0)}) .
4. An overridden value, whether done graphically or at the controller level via HOAs, shall display a visible indicator (color change, arrow, hand, etc.) on the impacted point in the corresponding equipment graphic. Furthermore, the indicator shall remain until the value returns to its auto or calculated value Example #1: if a chiller rotation sequence is temporarily overridden, then this override shall be displayed on the chiller graphic as long as it is in effect; Example #2: if a hot water valve is commanded to 60.0 % open, it shall display as currently overridden at that value on the corresponding airside equipment.

H. Timed Overrides

1. Timed overrides (i.e. the ability to override a point until the selected amount of time expires, at which time the point will return to normal programmed operation) will be required on the following (note: it is acceptable if additional points also have timed override capability in the system; however, at a minimum the following must be equipped with this feature):

Chill Water System
- Plant state
- Chiller lead/lag order number

Hot Water System
- System enable

All Air Handler Unit Types
- Occupancy mode / Request to run

General (All Setpoints)
- Space temperature setpoint
- Discharge air temp setpoint, Etc.

All variables must have a value entered. If no value, enter “N/A” or “—” to indicate no value is available or needed.

I. Provide configuration and tuning screens to be used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

3.5 IDENTIFICATION

A. **Control Panels Labels:** Provide a laminated engraved nameplate on all control panels shown on the "as installed" control diagrams. Coordinate engraving with nomenclature used on the diagrams. Identifying nameplates shall be secured to each main cabinet, and each control panels. Identifying nameplates shall have minimum of ½ inch high, engraved letters.

B. **Controller labels:** Provide a label affixed to the controller on all controllers with the name of the major equipment or system it serves and the Device Identification Number.

C. **Ceiling Labels:** Provide a label affixed to the ceiling grid below all terminal units, exhaust fans, fan coil unit, hot water coil, and duct static pressure sensors and labeled with the unit tag with those used on the "as installed" control diagrams. Label material shall utilize a black background with white typed lettering and 36 font on 3/4" label material. Coordinate labeling with nomenclature used on the diagrams.

D. **Sensor Labels:** Provide each space temperature and humidity sensors with label located on the inside of sensor cover. The label shall indicate which device sensor is controlling. If multiple sensors control a single device the sensors shall be labeled with an “A” or “B” etc. Label material shall utilize a white background with black typed lettering. Coordinate labeling with nomenclature used on the diagrams. For example, Multizone (AHU-X, Zone X), VAV (AHU-X, CVB-X), HWC (AHU-X, HWC-X). Provide sample to district prior to the start of labeling.

E. **Electrical Labels:** Provide an identification label on each transformer and relay. The label shall indicate which device they serve and their function. Handwritten labels are not acceptable. Label material shall utilize a white background with black typed lettering. Coordinate labeling with nomenclature used on the diagrams.

F. **Wire Labels:** Provide an identification label on each wire used for this system. Labels shall be affixed to both ends of the wire. Handwritten labels or handwriting on wiring is not acceptable.
   a. Wiring labels at VAV boxes shall include all wiring entering and exiting the VAV box control box with a description of where it is coming from and where it is going. This shall include all communication wiring and all field device wiring.
   b. Wiring labels at AHUs and FCUs shall include all wires entering and exiting the field controller with a description of where it is coming from and where it is going. This shall include all

communication wiring and all field device wiring.

G. **Lighting Contactor Labels:** Provide an identification labels on each lighting contactor. Labels shall include panel and circuit number serving contactor and the type and location of lights being served by contactor. (i.e. Bus Drop off Canopy). Handwritten labels are not acceptable. Coordinate labeling with nomenclature used on the diagrams.

H. **End Devices Labels:** Provide an identification label on each end device and sensor. Labels shall include the function of the sensor (i.e. Leaving Air Temperature Sensor). Handwritten labels are not acceptable. Coordinate labeling with nomenclature used on the diagrams.

I. All labeling as described above shall be completed prior to point checkout and startup. Label description shall be part of point checkout process.

3.6 WIRING FOR BUILDING MANAGEMENT AND CONTROL SYSTEMS

A. Prior to the start of any work, controls contractor and wiring subcontractor shall schedule a meeting with the owner and engineer to walk the site to discuss wiring system. Contractor shall provide a 7 day advanced notice of the requested meeting date.

B. Furnish and install all wire, conduit, raceways and cable systems required for the complete operation of the Building Management and Control System.

C. All wiring for the Building Management and Control System is specified in this section and includes, but is not limited to:
1. Wiring of interlock system.
2. Wiring of control instruments.
3. Wiring of control panels.
4. Wiring of related power supplies, i.e. transformers.
5. Wiring of 120 VAC power circuits for control panels and devices.

D. All materials and methods specified in this section shall comply with the requirements specified in Division 26 of this specification.

E. All power supply requirements shall be connected to the building electrical distribution system in an approved manner. Do not connect control equipment of circuits common with other building loads or devices.

F. Temperature control wiring shall be jacketed cables installed with or without conduit as specified below or single conductors installed in conduit. Control wiring shall have minimum 300V insulation for low voltage wiring and 600V insulation for line voltage wiring.

G. All line voltage control wiring, all low voltage control wiring which is exposed in the central plant, penthouse, and other similar spaces; all low voltage control wiring which is routed through concealed inaccessible locations shall be installed in conduit.

H. All low voltage control wiring which is routed through concealed accessible locations may be run without conduit provided that the wiring run without conduit is properly supported from the building structure on maximum 5' centers and does not depend upon the ceiling grid or the ceiling support system for support. Wiring run in plenum spaces shall be plenum rated. Support all plenum wiring in accessible locations in bridle rings, J-hooks, D rings. Plenum wiring is not to be supported within building structure or attached to conduit raceways. All low voltage wiring must be installed through supports. Wires shall be supported on 5’ centers and identified at each termination point and at 50’ centers minimum. Install wire parallel or perpendicular to the structural features of the building.

I. Line and low voltage control wiring shall not be installed in the same conduit with control wiring and shall not be installed in the same conduit with power wiring.

J. All wiring associated with building management and control system cover shall be as follows:
1. Sensor jacket color, Green
2. LAN communications, Yellow
3. All THHN wiring shall comply with Division 26 insulation color identification

4. Terminal Equipment Controller communications twisted pair. Wiring shall be a minimum of 22 AWG twisted and stranded unless controller manufacturer dictates otherwise.

3.7 MISCELLANEOUS

A. Exterior Lighting Control:
1. Provide individual astronomical time/photo sensor and scheduled time-based control of each lighting contactor shown on the drawings and identified on the existing contactor schedule.
2. The exterior lights shall be controlled by the BMCS using both time schedules and astronomical sunrise/sunset. The exterior lights shall automatically come on when the sun sets based on the longitude and latitude coordinates of the facility (adjustable +/- 30 minutes). At 11 p.m. (adjustable) the time schedule shall turn off the exterior lights. At 4:00 a.m. (adjustable) the exterior lights shall automatically turn on based on time schedule. Upon sunrise, which shall be based on longitude / latitude of the facility the exterior lights shall turn off.
3. Between sunrise and sunset, photo-sensor shall override scheduling if ambient light levels fall below set point (adjustable).
4. Provide momentary push button located at the Principals Office and Main Electrical room to energize exterior lighting for a preprogrammed length of time (adjustable).
   a. Provide separate control of each contactor.
5. BMCS shall monitor auxiliary contacts on each contactor to determine unit status.
6. Provide separate control of each contactor. Refer to contactor schedule on the electrical drawings for the service type of each contactor. Deviations from lighting control zones identified on the contactor schedule are not acceptable.

POINT DESCRIPTION	TYPE	DEVICE
Lighting Contactor	DO	Control Relay
Lighting Contactor Status	DI	Lighting Contactor Aux. Contact
Exterior Lighting Override Station	DI	Exterior Lighting Override Station

C. Photocell: Provide a photocell mounted on the north side of the building. Location is to be approved by Owner / Architect / Engineer.

POINT DESCRIPTION	TYPE	DEVICE
Photocell	AI	Contact

D. Interior Lighting Control:

1. Provide time based control of each lighting contactor shown on the drawings and identified on the existing contactor schedule.
2. Provide momentary push button located at the Administration Reception Area, Custodian office and at each security system keypad to energize interior lighting for a preprogrammed length of time (adjustable).
   a. Provide separate control of each contactor.

POINT DESCRIPTION	TYPE	DEVICE
Lighting Contactor	DO	Control Relay
Lighting Contactor Status	DI	Lighting Contactor Aux. Contact
Interior Lighting Override Station	DI	Interior Lighting Override Station

F. Outside Air: Provide a temperature sensor and a humidity sensor to monitor outside air conditions.

POINT DESCRIPTION	TYPE	DEVICE
Outside Temperature	AI	Thermistor
Outside Humidity	AI	Humidity Sensor

G. Temperature Sensor: Provide a temperature sensor in each MDF, IDF, IT/AV rooms to monitor space conditions. BMCS shall send alarm when the temperature (adjustable) is out of range.

POINT DESCRIPTION	TYPE	DEVICE
MDF/IDF Temperature	AI	Space Sensor

H. Electrical Demand Response - The BMCS system shall be provided with Electrical Demand Response as follows:

The user shall have 8 levels of adjustment to reduce the electrical demand of the facility. Each level shall be schedulable, respond to a command from the electrical provider, and have a button for instant activation.

The user shall have the following configuration within each configurable level:

- Setpoint Relaxation
- Outside Air Shutdown
- Equipment Shutdown
- Chiller Plant State Limit
- Chiller Shutdown

Setpoint Relaxation will allow the setpoints to shift away from their current setpoint based on the amount specified in the active demand response level. Outside Air Shutdown will deactivate the outside air equipment. Equipment Shutdown will shut down the HVAC equipment. Chiller Plant State Limit will limit the number of available states the chiller plant can use. A plant state of 0 will shut down the chiller plant. Chiller Shutdown will shut down the chillers but allow the pumps to run maintaining differential pressure setpoint.

All equipment shall be configurable to ignore any or all demand response commands. The user shall have the ability to run a report to adjust each of these parameters.

The Demand Response dashboard shall display all levels and their configuration, the electrical demand of the facility, the current level of reduction scheduled, the button to enable each level, and the average reduction each level is able to achieve.

The campus Demand Response shall be added and displayed on the district level demand response dashboard.

3.8 BUILDING ELECTRICAL USAGE

A. Building electric meter, provided by Division 26 shall send an analog signal representative of the building KW usage to the BMCS. Through the BMCS control module, the building meter shall integrate the input and calculate the buildings KWH usage. The BMCS control module shall show the current usage, monthly usage, year-to-date usage, and time and date of the highest peak demand for the month and year. Demand thresholds may be set to adjust set points and shed

loads in order to reduce peak consumption. The usage data shall be sent to the server and stored to be used by the Districts M-Power energy tracking system. The building meter shall monitor for surges and record such surges and notify operator of surges.

B. Electrical Quality monitoring:
1. Monitor Watts, VA, VAR, Demand, Imbalance, and Power Factor.

C. Provide a separate graphics page for all Electrical meters. The link to the graphics page shall be categorized under Misc. Equipment.

D. Transient Voltage Surge Suppression (TVSS) equipment and any line filtering equipment shall be monitored.

3.9 EXHAUST AND SUPPLY FANS

A. Provide interlocks as scheduled on the plans unless shown on the electrical drawings.

B. Provide BMCS override to disable operation of all exhaust and supply fans interlocked and/or specified throughout project.

C. Dampers and actuators shall be provided by this contractor and shall not be furnished with the exhaust fans. Dampers shall be duct mounted.

POINT DESCRIPTION	TYPE	DEVICE
Start/stop	DO	Control Relay
Outside Air Damper	DO	Electronic Operator
Fan Status	DI	Current Sensitive Relay

3.10 ELECTRIC UNIT HEATERS

A. An electric thermostat shall activate the unit and stage the electric coil to maintain room setpoint.

3.11 SINGLE ZONE VARIABLE AIR VOLUME AIR HANDLING UNIT (AHU-1C, AHU-2C, AHU-3C, AHU-4C, AHU-5C, AHU-6C, AHU-7C, AHU-8C, AHU-9C, AHU-10C)

A. This unit is furnished with a chilled water cooling coil, a hot water reheat coil, and a variable frequency drive. Control shall be as follows:
1. A room Thermistor sensing space temperature through the Direct Digital Control Panel shall vary the speed of the fan to maintain room setpoint. The air volume of the fan can range from 100% to 30% (adjustable) of the air quantity specified or to the outside air percentage whichever value is larger. A chilled water coil leaving air temperature sensor through the Direct Digital Control Panel shall modulate the cooling coil control valve to maintain the leaving air temperature as scheduled. When the fan is at minimum speed of its specified air quantity and the room temperature is below the room setpoint, the room Thermistor shall modulate the valve on the cooling coil and the valve on the hot water coil in sequence to maintain the desired space temperature. A room humidity sensor shall override the operation of the cooling coil control valve to maintain the relative humidity setpoint in the space. The room temperature sensor shall modulate the hot water reheat coil control valve to maintain the space temperature. The dehumidification sequence only applies after the fan has reached the minimum fan speed.

B. Outside air for these units are being provided pretreated from a separate Outside Air Unit via an Outside Air Variable Air Volume Terminal Unit or from a separate Outside Air Unit directly.

POINT DESCRIPTION	TYPES	DEVICE

POINT DESCRIPTION	TYPES	DEVICE
Start/Stop	DO	Control Relay
AHU Status	DI	Air Flow Sensing Switch
Fan Speed	AO	Variable Frequency Drive
Space Temperature	AI	Space Thermistor
Space Humidity	AI	Humidity Sensor
CHW Valve	AO (1)	Electronic Operator
Reheat HW Valve	AO (1)	Electronic Operator
Cooling Coil Leaving Air Temp.	AI	Averaging Sensor
Discharge Air Temperature	AI	Duct Thermistor

3.12 CONSTANT VOLUME OUTSIDE AIR HANDLING UNITS (OAU-2C)

A. These units consist of a hot water preheat coil, chilled water cooling coil and a variable frequency drive on the supply air fan. Control shall be as follows:
1. A temperature sensor located in the discharge of the hot water preheat coil shall, through the Direct Digital Control Panel, modulate the hot water control valve to maintain a discharge air temperature (adjustable) as indicated on the air handling unit schedule.
2. Provide a temperature low limit switch located on the discharge side of the hot water preheat coil to de-energize the air-handling unit when the temperature drops below 37°F. Device shall be manual reset and signal an alarm to the BMCS. Provide freeze protection sequence.
3. A temperature sensor located in the discharge of the air handling unit shall, through the Direct Digital Control Panel, modulate the chilled water control valve to maintain a discharge air temperature (adjustable) as indicated on the air handling unit schedule.
4. Open O.A. Damper before starting unit. Provide end switch to ensure damper is in the open position in either the manual (hand) or auto position of the motor starter.

POINT DESCRIPTION	TYPES	DEVICE
Start/Stop	DO	Control Relay
AHU Status	DI	Current Switch
Variable Speed Motor	AO	Motor Controller
CHW Valve	AO	Electronic Operator
HW Pre Heat Valve	AO	Electronic Operator
CHW Coil Leaving Air Temperature	AI	Averaging Probe
HW Preheat Coil Leaving Air Temp.	AI	Averaging Probe
Freeze Status	DI	Temperature Low Limit Switch
Outside Air Damper	DO	Electronic Operator
Discharge Air Temperature	AI	Duct Thermistor

3.13 VARIABLE VOLUME OUTSIDE AIR HANDLING UNITS (OAU-1C)

A. These units consist of a hot water preheat coil, chilled water cooling coil and a variable frequency drive on the supply air fan. Control shall be as follows:
   1. A temperature sensor located in the discharge of the hot water preheat coil shall, through the Direct Digital Control Panel, modulate the hot water control valve to maintain a discharge air temperature (adjustable) as indicated on the air handling unit schedule.
   2. Provide a temperature low limit switch located on the discharge side of the hot water preheat coil to de-energize the air-handling unit when the temperature drops below 37°F. Device shall be manual reset and signal an alarm to the BMCS. Provide freeze protection sequence.
   3. A temperature sensor located in the discharge of the air handling unit shall, through the Direct Digital Control Panel, modulate the chilled water control valve to maintain a discharge air temperature (adjustable) as indicated on the air handling unit schedule.
   4. Open O.A. Damper before starting unit. Provide end switch to ensure damper is in the open position in either the manual (hand) or auto position of the motor starter.

B. Variable air volume control:
   1. Duct static pressure sensor shall be located in the duct at a position approximately 2/3 the distance from the fan in the longest duct run. Location is to be approved by Engineer and coordinated with Section 23 05 93.
   2. The static pressure sensors shall, through the DDC panel, accept the signal from the operating control sensor to:
      a. Transmit a signal to the supply fan motor speed controller.
      b. Modulate the fan speed to maintain the desired static pressure.
      c. Coordinate signal with the fan motor speed controller specified in another section.
   3. Install a static pressure high limit safety device to de-energize the system.
      a. Manual reset.

POINT DESCRIPTION	TYPES	DEVICE
Start/Stop	DO	Control Relay
AHU Status	DI	Current Switch
Variable Speed Motor	AO	Motor Controller
CHW Valve	AO	Electronic Operator
HW Pre Heat Valve	AO	Electronic Operator
CHW Coil Leaving Air Temperature	AI	Averaging Probe
HW Preheat Coil Leaving Air Temp.	AI	Averaging Probe
Static Pressure	AI	Static Pressure Sensor
Freeze Status	DI	Temperature Low Limit Switch
Outside Air Damper	DO	Electronic Operator
Discharge Air Temperature	AI	Duct Thermistor
Static Pressure High Limit	DI	Static Pressure Switch

3.14 OUTSIDE AIR VARIABLE VOLUME TERMINAL UNITS

A. Each unit shall consist of a pressure independent variable volume damper. The terminal unit's damper shall be interlocked with the associated AHU fan.

1. The Controls Contractor shall furnish the terminal box manufacturer with a controller to be factory mounted. The controller shall display cfm, temperature, and damper position.
2. A space CO2 sensor associated with the AHU being served by the OAVAV terminal unit shall provide input to the central BMCS controller. The BMCS shall monitor CO2 levels of the zones served by the associated air handling unit and modulate the pretreated outside air damper to maintain set point 600 PPM (adjustable). This feature shall be user selectable on the AHU graphic page.

POINT DESCRIPTION	TYPES	DEVICE
Primary Air	AO	Variable Volume Damper Operator
Discharge Air Temperature	AI	Duct Thermistor
CO2 Concentration	AI	CO2 Sensor (OAVAV-1C)

3.15 OUTSIDE AIR HANDLING UNIT WITH DEMAND CONTROLLED VENTILATION (OAU-3C, OAU-4C)

A. These units consist of a hot water preheat coil, chilled water cooling coil and a variable frequency drive on the supply air fan. Control shall be as follows:
1. A temperature sensor located in the discharge of the hot water preheat coil shall, through the Direct Digital Control Panel, modulate the hot water control valve to maintain a discharge air temperature (adjustable) as indicated on the air handling unit schedule.
2. Provide a temperature low limit switch located on the discharge side of the hot water preheat coil to de-energize the air-handling unit when the temperature drops below 37°F. Device shall be manual reset and signal an alarm to the BMCS. Provide freeze protection sequence.
3. A temperature sensor located in the discharge of the air handling unit shall, through the Direct Digital Control Panel, modulate the chilled water control valve to maintain a discharge air temperature (adjustable) as indicated on the air handling unit schedule.
4. Open O.A. Damper before starting unit. Provide end switch to ensure damper is in the open position in either the manual (hand) or auto position of the motor starter.

B. A space CO2 sensor associated with the air handling unit (AHU) being served by the outside air handling unit (OAU) shall provide input to the central BMCS controller. The BMCS shall monitor CO2 levels of the zones served by the associated air handling unit and modulate the pretreated outside air unit supply fan to maintain set point 600 PPM (adjustable). This feature shall be user selectable on the AHU graphic page.

POINT DESCRIPTION	TYPES	DEVICE
Start/Stop	DO	Control Relay
AHU Status	DI	Current Switch
Variable Speed Motor	AO	Motor Controller
CHW Valve	AO	Electronic Operator
HW Pre Heat Valve	AO	Electronic Operator
CHW Coil Leaving Air Temperature	AI	Averaging Probe
HW Preheat Coil Leaving Air Temp.	AI	Averaging Probe
Freeze Status	DI	Temperature Low Limit Switch
Outside Air Damper	DO	Electronic Operator

POINT DESCRIPTION	TYPES	DEVICE
Discharge Air Temperature	AI	Duct Thermistor
CO2 Concentration	AI	CO2 Sensor

3.16 HYDRONIC FAN COIL UNITS (CHWFCU-1)

A. Each fan coil unit is furnished with a filter, a chilled water coil, and a supply fan. Control shall be as follows:
   1. A space temperature sensor shall, acting through a terminal equipment controller, modulate the valves on the chilled water cooling coil and hot water reheat coil in sequence to maintain the desired space temperatures.
   2. Start/stop of fan coil unit shall be by terminal equipment controller.
   3. The outside air units providing the outside air shall be activated when the fan coil units are operating during the occupied periods.

POINT DESCRIPTION	TYPES	DEVICE
Start/Stop	DO	Control Relay
CHW Valve	AO	Electronic Operator
Space Temperature	AI	Space Thermistor
HW valve	AO	Electronic Operator
Discharge Air Temperature	AI	Duct Thermistor
Fan Status	DI	Current Switch

3.17 DX DUCTLESS MINI SPLIT SYSTEMS (DMS-1/DMSCU-1; DMS-2/DMSCU-2)

A. Each system is furnished with a cooling only direct expansion coil ductless highwall unit and outdoor air cooled condensing unit.
   1. Internal unit controls shall control operation.

B. If the factory A2L refrigerant leak detector is triggered, BMCS shall receive an alarm and the factory A2L leak dissipation board shall disable compressor, shut off refrigerant valves, enable unit supply fan, and deactivate all heat associated with the system. When the A2L refrigerant leak detection system is reset, all systems shall go back to normal operation. Refer to equipment specifications for additional information on the A2L refrigerant leak detection system and coordinate with equipment manufacturer to ensure all points and sequence of operations are in compliance with manufacturer requirements.

POINT DESCRIPTION	TYPES	DEVICE
Refrigerant Leak Alarm	DI	Factory A2L Refrig. Leak Detection System

3.18 CHILLED WATER SYSTEM CONTROL (MAIN CENTRAL PLANT)

A. The system consists of two air-cooled chillers and two dedicated primary chilled water pumps.

B. Temperature sensors located in the building common chilled water supply and return piping and the turbine flow meter located in the building chilled water common supply piping shall, acting through the DDC system, be used to calculate the building BTUH requirements.

C. During start-up, one primary pump shall start. After flow has been indicated from the flow switch for an adjustable time period, the chiller shall be activated.

D. When the load calculated from the temperature sensors and flow meter exceeds the capacity of one chiller for an adjustable time period, the second primary pump and chiller shall be activated.

E. If the load drops to below half the capacity (adjustable) of one chiller, then the lag chiller will be deactivated. The primary pump serving the chiller will remain on for 3 minutes (adjustable) and then be deactivated.

F. A temperature sensor located in the chiller by-pass piping shall send an alarm to the host computer and shall start the lag chiller after an adjustable time delay, if the temperature in the by-pass is above 3 degrees (adjustable) higher than the temperature in the common supply from the chillers. This indicates the flow is moving from the primary loop to the secondary loop.

G. Provide time delays between pump starts and stops to allow system to stabilize.

H. Change lead/lag rotation on a weekly basis.

I. Provide the Minimum BACnet interface points for remote operations including resetting from central Maintenance (alarms/setpoints) as follows:
1. Chiller alarms – Low evaporator temp., low evaporator/condenser water flow, loss of power.
2. Chiller temperature discharge setpoint
3. Chiller evaporator and condenser pressures
4. Chiller oil pressure
5. Discharge superheat
6. Condenser and evaporator approach temperatures
7. Condenser and evaporator flows (GPM)
8. Phase readings (volts/amps) for each phase

J. The district participates in a load shedding program during electrical brownouts. There shall be a program in which all the District's chillers' discharge setpoints can be raised immediately. Refer to Demand Response portion of this specification for additional information.

POINT DESCRIPTION	TYPES	DEVICE
Chiller Start/Stop	DO	Control Relay
Chiller % RLA (Each chiller)	AI	Chiller Control Module
Chiller Alarm	DI	Safety Alarm Contact
Chiller Water Supply Temperature	AI	Pipe RTD (Each)
Pump Start/Stop	DO	Control Relay
Pump Status	DI	Current Sensitive Relay
Pump Speed Controller	AO	Motor Controller
Building Flow	AI	Turbine Flow Meter
Building Supply Water Temp.	AI	Temperature Sensors
Building Return Water Temp.	AI	Temperature Sensors
Decoupler Temperature	AI	Temperature Sensor

3.19 SECONDARY CHILLED WATER PUMPING SYSTEM CONTROL

A. The system consists of two variable speed secondary chilled water pumps controlled as follows:
1. The chilled water pumping system will be energized whenever there is a call for cooling in the building system.
2. A system differential pressure sensor shall sequence the pumps and signal the chilled water pump speed controllers.
   a. Stage the pumps to maintain desired system differential pressure.
   b. Modulate the pump speed controllers to maintain desired system differential pressure.
   c. Coordinate with the pump motor speed controller specified in another section.
3. Alternate the lead pump on a daily basis.
4. Location and quantity of sensors to be approved by Engineer.

POINT DESCRIPTION	TYPES	DEVICE
Pump Start/Stop	DO	Control Relay
Pump Status	DI	Current Sensitive Relay
System Differential Pressure	AI	Pressure Sensor
Pump Speed Controller	AO	Motor Controller

3.20 HYDRONIC HOT WATER HEATING SYSTEM

A. This system consists of one condensing hot water boilers with a constant flow primary boiler pump and one variable flow hot water secondary pumps. Control of the hydronic hot water heating system is as follows:
1. Energize the hydronic hot water heating system whenever there is a call for heating in the building.
   a. Monitor all control valves to determine if a heating requirement exists.
2. Energize the hybrid sequence controller specified elsewhere.
   a. The hybrid sequence controller shall control all functions and sequencing of the hot water heating boilers.
   b. Connect all boilers to the master boiler controller specified elsewhere with communication cable as required.
3. Hydronic hot water heating system supply temperature reset.
   a. A temperature sensor sensing outdoor temperature shall provide an input to the hybrid sequence controller to reset the hot water supply temperature.
      1) Maintain 180°F supply water temperature whenever the ambient temperature is 20°F and below.
      2) Maintain 120°F supply water temperature whenever the ambient temperature is 60°F and above.
      3) All reset temperatures shall be adjustable through the BMCS.
4. Secondary hot water pump control:
   a. A system differential pressure sensor shall modulate the hot water pump variable frequency drive and maintain system differential pressure.
   b. This system shall be completely adjustable in the field.

POINT DESCRIPTION	TYPES	DEVICE
Sequence Controller	DO	Control Relay
Boiler Alarm Status	DI	Safety Relay (Each Boiler)
Secondary Hot Water Pump Start/Stop/Modulation	AO	Variable Frequency Drive (Each Pump)
Pump Status	DI	Current Switch

POINT DESCRIPTION	TYPES	DEVICE
Building Hot Water Supply Temp.	AI	Pipe RTD
Building Hot Water Return Temp.	AI	Pipe RTD
Boiler Discharge Water Temp.	AI	Pipe RTD (Each Boiler)
Ambient Temperature	AI	Thermistor
Boiler Supply Water Reset	AO	Hybrid Sequence Controller
Inlet Temperature (Read Only		Bacnet Card (Each Boiler)
Outlet Temperature (Read Only)		Bacnet Card (Each Boiler)
Header Temperature (Read Only)		Bacnet Card (Each Boiler
Boiler State (Read Only)		Bacnet Card (Each Boiler)
Error Code (Read Only)		Bacnet Card (Each Boiler)

3.21 START-UP AND POINT VERIFICATION

A. Final startup and point verification shall include the following information.
   1. Field panel checkout:
      a. Verify enclosure is not mounted on vibrating surface.
      b. Verify class I and class II wiring is separated within enclosure.
      c. Check for shorts/grounds/induced voltages/proper voltages.
      d. Verify proper point terminations in accordance with as-builts.
      e. Verify that all modules are in proper place and addressed.
      f. Verify proper power voltage.
      g. Load database and programming.
      h. Startup the panel.
      i. Point and device checkout.
   2. Analog input point checkout:
      a. Verify the correct wiring terminations per the design documentation package, at the field panel. Verify that all wiring and terminations are neat and dressed.
      b. Verify the point address by checking that the analog input instrument is wired to the correct piece of field equipment. Do this by altering the environment at the sensing element or by disconnecting one of the wires at the sensor, and verifying that the reading at the field panel has reacted to this change.
      c. Verify the point database to be correct, (i.e., alarmability, alarm limits, slope/intercept, engineering units, etc.). Verify that the correct change of value (COV) limit has been defined.
      d. Verify the sensor has the correct range and input signal. (i.e., 20-120°F, 4 - 20 ma). Verify that the device is mounted in the correct location and is wired and installed correctly per the design documentation package.
      e. Set-up and/or calibrate any associated equipment (i.e., panel LCD meters, loop isolators, etc.). Verify that these auxiliary devices are mounted in the correct location and are wired and installed correctly per the design documentation package.
      f. Verify the correct reading at the field panel using appropriate MMI devices. Verify that any associated LCD panel meters indicate the correct measured value.
   3. Digital input point checkout:
      a. Verify the device is correctly wired and terminated as shown in the design

documentation package. Verify that all wiring and terminations are neat and properly secured.

b. Verify the point address by verifying that the digital input is correctly terminated at the controlled piece of equipment.

c. Verify the point database is correct (i.e., point name, address, alarmability, etc.).

d. Set-up and/or calibrate the associated equipment, i.e. smoke detector, high/low temp detector, high/low static switch, end switch, current relay, pressure switch, etc. is mounted in the correct location, and is wired and installed correctly per the control system installation drawings.

e. With the controlled equipment running or energized as described in the digital output checkout procedures, verify the correct operation of the digital input point and associated equipment by putting the digital input monitored equipment into its two states. Verify that the proof or status point indicates the correct value at the operator's terminal and that the status led is giving the proper indication in each mode of operation (on/off).

4. Digital output point checkout:

a. Verify that device is correctly wired and terminated as shown in the design documentation package.

b. Verify that the correct voltage is utilized in the circuit.

c. Verify the point database to be correct (i.e. point name, address, etc.).

d. Check and verify that the end device responds appropriately to the digital output(s).

e. After verifying the set-up and operation of any associated digital input/proof points, check and verify correct operation of the logical point and associated equipment by commanding the point to all possible states (i.e. off, on, fast, slow, auto, etc.). Verify that the defined proof delay is adequate for all modes of operation.

f. If any interlocked equipment exists that has independent hand-off-auto or auxiliary control wiring, verify correct operation of same. Also check that any interlocked equipment such as EP switches for damper operation or exhaust and return fans are wired correctly and operate correctly.

g. Verify that the controlled piece or pieces of equipment cannot be caused to change state via the digital output if an associated hand-off-auto switch is in the hand/on or hand/off mode of operation, unless specified as a fireman's override point etc.

5. Analog output point checkout:

a. Verify the correct wiring or piping terminations per the design documentation package, at the field panel. Verify that all wiring and piping terminations are neat and dressed.

b. Insure that the correct output device(s) are installed per the Control System Installation Drawings. (i.e., I/P or P/I transducers, transformers, power supply, etc.). Verify that these devices are installed, wired and piped correctly. Verify that any configuration jumpers are in the proper settings for the required application. Verify related transformers are fused in accordance with installation drawings.

c. Verify the point database to be correct. Verify that the correct COV limit has been defined.

d. Verify the point address by checking that the analog output is wired and/or piped to the correct output transducer and/or equipment.

e. Verify that the controlled device is calibrated (i.e., 3-8PSI valve, 8-13 PSI damper motor, 4-20 ma variable frequency drive, etc.) and is in the correct location, and is wired or piped and installed correctly per the design documentation package. If the controlled device is not calibrated, then a three-point (high, low and mid-point) calibration procedure must take place. Verify proper operation of the end

device. When calibration has been verified, ensure that installation drawings, point database, and PPCL have been updated.

f. Set-up and or calibrate any associated equipment, (i.e., panel LCD meters, loop isolators, pneumatic gauges, etc.). Also verify that these auxiliary devices are mounted in the correct location, and are wired or piped and installed correctly per the design documentation package.

g. After verifying the set-up and operation of any associated equipment check for the correct operation of the logical point and associated equipment by commanding the analog output to the top and bottom of its range. Verify that the control device(s) responded appropriately as indicated by the design documentation package. Check to insure that all network terminals, host console devices, etc. can also command these outputs.

h. Check that all pneumatic gauges, pilot positioners and LCD panel meters indicate the correct values.

6. Terminal equipment controller checkout:
   a. Load program database
   b. Enable programs
   c. Verify sequence of operations
7. Programming checkout:
   a. Provide checkout for each system and sequence of operation.
   b. The following are sample sequence of operations tests. The intent of these procedures is to provide a plan of action to verify system operations via block checks of the project specific sequence of operations. The procedures may be used in this format, or one procedure to a page should more detail be required. The procedures outlined below should be verified for accuracy, and may be modified to meet your specific requirements.
   c. Description of Test: AHU Alarm Checkout. Verify AHU-1 discharge air temperature alarming is operational and is received at the designated terminal.
   d. Input to Trigger Test: Change discharge temperature high alarm limit through software to a value below the current discharge temperature (discharge temperature - 10°F).
   e. Expected Outcome: A high temperature alarm will be received per the Alarm Definition Report at its designated terminal.
   f. Provide signoff sheet with indication for test Pass, Fail, Date of test and Initials for signoff.
8. Workstation checkout:
   a. Verify the operation of all trunk interface equipment.
   b. Verify all workstation software, including options, based upon the installation instructions for the PC.
   c. Perform software backup (site, options, etc.)
   d. Complete workstation configuration report for owner signoff.
   e. Provide verification that all graphics have been created, as required by project bid documents.

3.22 TESTING AND ACCEPTANCE

A. General:
   1. After completion of installation and start-up procedures, commence the specified 3-phase verification and testing sequence leading to final acceptance.
      a. Follow in the order specified.
      b. Each testing phase shall be satisfactorily completed before entering the next phase.
   2. Prior to entering each phase of the sequence, submit for approval, a written agenda describing in detail the procedure to be followed to meet the requirements for each specified verification, test or demonstration.

3. Submit for approval, a sample of the form on which the test will be reported.
   a. Identify project.
   b. Provide a list of all points, arrange in numerical order of point addresses.
      1) Show point descriptor and location of each.
      2) Indicate DDC panel that processes each point.
      3) Use the list as a basis for the specified report form.
   c. Signatures of participants and observers.
   d. Results.
   e. Description of adjustment or corrections of points in error.
   f. Date.
4. Provide schedule of tests. Estimate dates of significant events.
5. Test, calibrate and adjust each point in the system as specified.
6. Provide documentation of all tests and verifications as specified.
7. Provide trend reports indicating proper control of all points for an extended period of time.

B. Phase 1 - Testing, Calibrating, and Adjusting:
1. Operate each analog point in the entire system.
   a. At a point in the upper quarter of its range.
   b. At a point in the lower quarter of its range.
   c. At its operating point.
2. Provide personnel and diagnostic instruments at both the central and remote locations.
3. Provide testing stimulants for alarms.
4. Use digital meters of double the accuracy of the instruments being calibrated.
5. Provide an approved test device for simulating high and low temperatures.
6. When the function is performed, read values at the central control and observe the actual function at the field instrument.
7. Exercise each binary point and observe indication at console and simultaneously observe operation in the field.
8. Submit an operation report for each point in the system, in approved format, and describe any corrective or adjusting action taken.
9. Test all power transducers with a Dranetz Power Analyzer.

C. Phase 2 - Equipment and Point Verification:
1. Verify calibration or function of each point.
   a. Verify analog points at operating value.
   b. Record on specified form.
   c. Make approved adjustments to out of tolerance points.
      1) Identify these points for ready reference.
2. After verification procedure in completed:
   a. Verify corrected points.
   b. Record on specified form.
   c. Points requiring correction.
      1) Replace sensor or actuator if electrical measurements indicated components are out of specified tolerance.

D. Phase 3 - Software Verification:
1. Submit agenda and report format for software demonstrations.
2. Demonstrate to the Owner and the Engineer that all software programs and automatic control sequences function as specified.
3. Demonstrate compliance with response time specifications.
   a. Simulate normal heavy load conditions.
   b. Initiate at least ten successive occurrences on normal heavy load conditions as specified, and measure response time of typical alarms and status changes.

04. Provide written documentation of demonstration, signed by representatives of the Contractor and Engineer.

E. Provide the following reports to Engineer at final completion of all Testing:
1. List of all points.
2. List of all points currently in alarm.
3. List of all disabled points.
4. List of all points in over-ride status.
5. List of all points currently locked out.

6. List of user accounts and access levels.
7. List all weekly schedules.
8. List of holiday programming schedules.
9. List of limits and deadbands.
10. System diagnostics reports including, list of DDC panels on line and communicating, status of all DDC terminal units device points.
11. List of programs.
12. Provide trend data reports to ensure proper operation and sequence control of BMCS.

F. Substantial Completion of the BMCS will not occur until completion and acceptance of all testing and acceptance procedures.

3.23 TRAINING

A. The contractor shall provide training to owner personnel in a laboratory classroom environment. Each student shall be provided with a dedicated computer workstation utilizing a simulated BAS software platform that is installed for this project. The instructor shall have CEU accreditation for all training courses offered. Provide documentation for this requirement in the initial BAS submittal. If contractor does not have CEU instructor or offer these courses locally include cost for tuition, travel and boarding to send students to manufacturer training facility. The owner shall not incur any additional cost for training classes as listed below for the first 3 years. The following training courses shall be conducted for 4 individuals on 4 separate occasions each year for a 3-year period (12 classes total) following substantial completion:
1. Operator Overview – Consists of general system navigation, scheduling functions, setpoint modifications and parameter adjustments.
2. Advanced Topics Overview – Detailed analysis of trend setup/configuration, trend historian, alarm setup, alarm actions (email, printing, etc.), point renaming, and detailed analysis of equipment parameters.
3. Program/Logic Manipulation – Modify system programs as needed for additions and modifications.
4. Graphic Manipulation – Modify system graphics as needed for additions and modifications.
5. Hardware Troubleshooting – Classroom setup shall have HVAC mock-up systems. Operators shall be able to interact with this live system through the BAS utilized for this project. Class will provide students the ability to identify and repair common problems regularly encountered.
6. Software Troubleshooting - Classroom setup shall have HVAC mock- up systems. Operators shall be able to interact with this live system through the BAS utilized for this project. Class will provide students the ability to identify and repair common issues that can be utilized via software modifications.
7. Central Plant Operation – At a minimum the instructor shall thoroughly explain different types of central plant equipment and proper system modifications that can be made to enhance system performance and energy savings.
8. HVAC System Training – Objective of this class is to provide basic HVAC system knowledge of various types of systems including types of air side distribution and water side distribution. Topics such as thermodynamics, psychometrics, de- humidification, and demand control ventilation shall be thoroughly explained.

B. Since the Owner may require personnel to have more comprehensive understanding of the hardware and software, additional training must be available from the Contractor.

3.24 PROJECT MANAGEMENT

A. Provide a designated project manager who will be responsible for the following:
1. Construct and maintain project schedule.
2. Authorized to accept and execute orders or instructions from General Contractor, Owner / Architect & Engineer.
3. Attend project meetings as necessary to avoid conflict and delays.
4. Make necessary field decisions relating to this section.
5. Coordination / Single point contact.
6. Have Internet access for project management.

3.25 CLEANING

A. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.

B. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.

C. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

END OF SECTION

SECTION 23 20 00

HVAC PIPE AND PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install pipe and pipe fittings for piping systems specified in Division 23 - Mechanical.

1.2 RELATED WORK

A. Division 23 Mechanical:
1. Earthwork.
2. Valves, Strainers and Vents.
3. Vibration Isolation.
4. Insulation.
5. Other Piping Sections

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. The particular type of pipe and fittings for each system is specified in the individual sections.

2.2 JOINTS

A. Make screwed joints using machine cut USASI taper pipe threads. Apply a suitable joint compound to the male threads only. Ream the pipe to full inside diameter after cutting. All-thread nipples are not permitted.

B. Dissimilar Metals. Make joints between copper and steel pipe and equipment using insulating unions or couplings such as Crane Company #1259; EPCO as manufactured by EPCO Sales, Inc.; or an approved equal.

C. Solder joints.
1. Prior to making joints, cut pipe square and ream to full inside diameter. Clean exterior of pipe and socket. Apply a thin coat of suitable fluxing compound to both pipe and socket, and fit parts together immediately.
2. Heat assembled joint only as required to cause the solder to flow. Run the joint full, slightly beaded on the outside, and wipe to remove excess solder.
3. Use silver brazing alloy or Sil-Fos on refrigerant piping and on underground piping. Use lead free solder on all other copper piping.

D. Make welded joints as recommended by the standards of the American Welding Society. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Keep inside of fittings free from globules of weld metal. The use of mitered joints is not approved.

E. Flanged.
1. Prior to installation of bolts, center and align flanged joints to prevent mechanical pre-stressing of flanges, pipe or equipment. Align bolt holes to straddle the vertical, horizontal or north-south centerline. Do not exceed 3/64" per foot inclination of the flange face from true alignment.
2. Use flat-face companion flanges only with flat-faced fittings, valves or equipment. Otherwise, use raised-face flanges.
3. Install gaskets suitable for the intended service and factory cut to proper dimensions. Secure with manufacturers recommended gasket cement.
4. Use ANSI nuts and bolts, galvanized or black to match flange material. Use ANSI 316 stainless steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets.
5. Use carbon steel flanges conforming to ANSI B16.5 with pipe materials conforming to

ASTM A 105 Grade II or ASTM A 108, Grade II, ASTM A 53, Grade B. Use slip-on type flanges on pipe only. Use welding neck type flanges on all fittings. Weld slip-on flanges inside and outside.

6. Keep flange covers on equipment while fabricating piping. Remove when ready to install in system.

F. Mechanical Joints: Provide a stuffing box type mechanical joint adapted to use gasket, cast iron gland and bolts. Coat bolts with bitumastic enamel. Use joint parts similar in design to one of the following:
   1. Doublex Simplex Joint manufactured by the American Cast Iron Pipe Company, Birmingham, Alabama.
   2. U.S. joints manufactured by the United States Pipe and Foundry Company, Burlington, New Jersey.
   3. Boltite Joint manufactured by the McWane Cast Iron Pipe Company, Birmingham, Alabama.
   4. Flexlamp manufactured by the National Cast Iron Pipe Company, Birmingham, Alabama.

2.3 UNIONS

A. Use 150 lb. standard (300 lb. WOG) malleable iron, ground joint unions with bronze seat. Provide flanged joints on piping 2-1/2" and larger.
   1. Where pipe material of different types join, use a dielectric union. Union shall be threaded, solder or as required for its intended use.

2.4 BRANCH CONNECTIONS

A. Pipe 2" and Smaller: For threaded piping, use straight size reducing tee. When branch is smaller than header, a nipple and reducing coupling or swagged nipple may be used.

B. 2-1/2" through 36": For welding piping, when branch size is the same as header size, use welding tee. For threaded branch connections, use 3000 lb. full coupling or Thread-o-let welded to header.

2.5 GASKETS

A. High Temperature Piping: Provide 1/16" thick ring gaskets of aramid reinforced SBR such as Garlock #3200 or 3400 or equal by Advanced Products and Systems.

B. Other Piping: Provide ring rubber gaskets, Garlock #7992 or equal by Advanced Products and Systems. Use 1/8" thick cloth reinforced neoprene gaskets. For smaller than 6", use 1/16" thick gasket.

2.6 FLOORS AND CEILING PLATES

A. Provide chrome-plated floor and ceiling plates around pipes exposed to view when passing through walls, floors, partitions, or ceilings in finished areas; size plates to fit pipe or insulation and lock in place.

2.7 DOMESTIC MANUFACTURE

A. All piping material, pipe and pipe fittings shall be manufactured in the United States of America.

PART 3 - EXECUTION

3.1 PIPE FABRICATION AND INSTALLATION

A. Make piping layout and installation in the most advantageous manner possible with respect to headroom, valve access, opening and equipment clearance, and clearance for other work. Give particular attention to piping in the vicinity of equipment. Preserve the required minimum access clearances to various equipment parts, as recommended by the equipment manufactured, for maintenance.

B. Cut all pipes to measurement determined at the site. After cutting pipe, remove burrs by reaming. Bevel plain ends of ferrous pipe.

C. Install piping neatly, free from unnecessary traps and pockets. Work into place without springing or forcing. Use fittings to make changes in direction. Field bending and mitering is prohibited. Make connections to equipment using flanged joints, unions or couplings. Make reducing connections with reducing fittings only.

D. Install piping without tapping out of the bottom of pipe.

3.2 WELD

A. Weld and fabricate piping in accordance with ANSI Standard B31.1, latest edition, Code for Pressure Piping.

B. Align piping and equipment so that no part is offset more than 1/16". Set fittings and joints square and true, and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

C. Do not permit any weld to project within the pipe so as to restrict flows. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.

D. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

E. Remove dirt, scale and other foreign matter from inside piping before tying into existing piping sections, fittings, valves or equipment.

F. Bevel ends of ferrous pipe.

3.3 OFFSETS AND FITTINGS

A. Due to the small scale of drawings, the indication of offsets and fittings is not possible. Investigate the structural and finish conditions affecting the work and take steps required to meet these conditions.

B. Install pipe close to walls, ceilings and columns so pipe will occupy minimum space. Provide proper spacing for insulation coverings, removal of pipe, special clearances, and offsets and fittings.

3.4 SECURING AND SUPPORTING

A. Support piping to maintain line and grade, with provision for expansion and contraction. Use approved clevis-type or trapeze-type hangers connected to structural members of the building. Single pipe runs to be supported by approved clevis type hangers. Multiple pipe runs to be supported by approved trapeze type hangers. Do not support piping from other piping or structural joist bridging. Review structural drawings for additional information.

B. Provide supports both sides and within 12” of each horizontal elbow for pipe 6" and larger.

C. Support vertical risers with steel strap pipe clamps of approved design and size, supported at each floor. Support piping assemblies in chases so they are rigid and self-supported before the chase is closed. Provide structural support for piping penetrating chase walls to fixtures. On chilled water pipe supports shall be outside the insulation.

D. Where insulation occurs, design hangers to protect insulation from damage. Pipe saddles and insulation shields, where required, are specified in the appropriate insulation section and are sized in accordance with the schedule on the drawings.

E. Install trapeze hangers, properly sized, to support the intended load without distortion. Use hangers with 1-1/2” minimum vertical adjustment.

F. Use electro-galvanized or zinc plated beam clamps if acceptable to the structural engineer,

threaded rods, nuts, washers and hangers. All hanger rods shall be trimmed neatly so that no more than 1 inch of excess hanger rod protrudes beyond the hanger nut. Use only on beams as directed by the Structural Engineer.

G. At outdoor locations, all supports, brackets and structural members shall be hot-dipped galvanized.

H. Provide hangers within 3' of pipe length from all coil connections.

I. Support spacing: As recommended by the project structural engineer and support manufacturer, but not more than listed below. Not to exceed spacing requirements of smallest pipe.

Pipe Size	Copper & Steel Max. Support Spacing, Ft.	Cast Iron Max. Support Spacing, Ft.	Minimum Rod Diameter, Inches
1" & smaller	6		3/8
1-1/4" & 1-1/2"	8	5	3/8
2"	10	5	3/8
3"	10	5	1/2
4" & 5"	10	5	5/8
6" and above	10	5	3/4

3.5 PIPE SUPPORTS

A. Provide P1001 or P 5000 Unistrut metal framing members and appurtenances for pipe support. Hot-dip galvanized members and appurtenances when located outside. Sagging of pipes or supports is not acceptable.

B. Adjustable clevis hangers shall be used for single pipe supports; Anvil Fig. 260. When oversized clevis is used, a nipple shall be placed over the clevis bolt as a spacer to assure that the lower U-strap will not move in on the bolt. Provide adjustable clevis with a nut / washer above and below the hanger on the support rod. Ring type clevis hangers are not acceptable.

C. Provide Anvil Figure 45 galvanized or primed and painted channel assembly for trapeze hangers.

3.6 PIPE SUPPORTS ON ROOF

A. Support condensate drain pipe on roof with Portable Pipe Hanger Model PP-10 with roller and fully adjustable height throughout pipe run. Base material shall be high density / high impact polypropylene with UV inhibitors and anti-oxidants. Provide with hot dip galvanized rod finish and framing. Nuts and washers shall be hot dip galvanized.

3.7 ANCHORS

A. Provide anchors as required. Use pipe anchors consisting of heavy steel collars with lugs and bolts for clamping to pipe and attaching anchor braces. Install anchor braces in the most effective manner to secure desired results. Do not install supports, anchors or similar devices where they will damage construction during installation or because of the weight or the expansion of the pipe. When possible, install sleeves in structural concrete prior to pouring of concrete.

3.8 FLOOR PENETRATIONS

A. At locations where pipe passes through floors, provide watertight concrete curb around penetration.

3.9 PIPE SLEEVES

A. Sleeves through masonry and concrete construction:
   1. Fabricate sleeves of Schedule 40 galvanized steel pipe.
   2. Size sleeve large enough to allow for movement due to expansion and to provide continuous insulation.

B. Sleeves through gypsum wall construction.

1. Fabricate sleeves of 16 gauge galvanized sheet metal.

C. Sleeves through elevated slab construction.
1. Fabricate sleeves of Schedule 40 galvanized steel pipe with welded center flange in floor.

D. Extend each sleeve through the floor or wall. Cut the sleeve flush with each wall surface. Sleeves through floors shall extend 2” above floor lines for waterproofing purposes. Slab on grade floors shall not be sleeved except where penetrating waterproofing membrane or insect control is required.

E. Caulk sleeves water and air tight. Seal annular space between pipes and sleeves with mastic compound to make the space water and air tight.

F. For sleeves below grades in outside walls, provide Thunderline Link-Seal or Advance Product and System Interlynx, with 316 stainless steel nuts and bolts, with cast iron pressure plate.

G. Provide chrome plated escutcheon plates on pipes passing through walls, floors or ceilings exposed to view. At exterior walls, stainless steel sheet metal is to be used.

H. For sleeves through fire and smoke rated walls, seal with a UL through-penetration firestop, rated to maintain the integrity of the time rated construction. Install in accordance with the manufacturer's installation instructions. Comply with UL and NFPA standards for the installation of firestops. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

3.10 ISOLATION VALVES

A. Provide piping systems with line size shutoff valves located at the risers, at main branch connections to mains for equipment, to isolate central plant, and at other locations.

3.11 DRAIN VALVES

A. Install drain valves at low points of water piping systems so that these systems can be entirely drained. Install a line size drain valve for pipes smaller than 2" unless indicated otherwise. For pipes 2-1/2" and larger, provide 2" drain valves unless indicated otherwise. Drain valves shall be plugged when not in use and at completion.

3.12 CLEANING OF PIPING SYSTEMS

A. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge and circulate. Flush the chilled and hot water systems utilizing the filter feeders.

B. Install temporary strainers at the inlet of pumps and other equipment as necessary where permanent strainers are not indicated. Keep strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blow down ball valve and pipe to nearest drain. Blow down strainers, remove and clean as frequently as necessary.

C. Phase One: Initial flushing of system. Remove loose dirt, mill scale, weld beads, rust and other deleterious substances without damage to system components. Open valves, drains, vents and strainers at all system levels during flushing procedures. Flush until “potable water clear” and particles larger than 5 microns are removed.

D. Connect dead-end supply and return headers, even if not shown on the drawings, and provide terminal drains in bottom of pipe end caps or blind flanges.

E. Dispose of water in approved manner.

F. Phase Two: Cleaning of Piping Systems. Remove, without chemical or mechanical damage to any system component, adherent dirt (organic soil), oil, grease, (hydrocarbons), welding and soldering flux, mill varnish, piping compounds, rust (iron oxide) and other deleterious substances not removed by initial flushing. Chemical shall be equal to Nalco 2578 prepping compound. Insert anti-

foam compound as necessary. Circulate for 48 hours or as recommended by the manufacture. Dispose of water in approved manner. Flush system and replace with clean water. Verify compatibility of chemicals used with existing chemical treatment program on remodel projects.

G. Phase Three: Final flushing and rinsing: Flush and rinse until “potable water clear” and particles larger than 5 microns are removed. Operate valves to dislodge any debris in valve body. Dispose of water in approved manner.

H. Submit status reports upon completion of each phase of work on each system.

I. Special requirements, if any, are specified in the sections on each type of piping or in the section on Water Treatment Systems.

3.13 TESTING

A. Test piping after installation with water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair leaks and retest system until proven watertight.

B. Do not insulate or conceal piping systems until tests are satisfactorily complete.

C. If any leaks or other defects are observed, suspend the test and correct the condition at once. Repeat testing until leaks are eliminated and the full test period is achieved.

D. The satisfactory completion of testing does not relieve the Contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories.

3.14 PIPE MARKERS

A. Identify interior exposed piping and piping in accessible chases or plenums with Opti-Code Brady Pressure Sensitive Adhesive Pipe Markers, consisting of pipe marker and direction of flow arrow tape. Clean pipe prior to installation. Background colors of markers, arrows and tape for each type of system shall be the same. Meet ANSI/OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

B. Identify exterior and mechanical room piping with Snap Around pipe markers through 4-inch pipe and Strap Around markers 5-inch pipe and larger. Pipe markers consisting of pipe marker and direction of flow arrow tape; background colors of markers, arrows and type for each type of system shall be the same. Meet ANSI / OSHA standards and clearly identify each system. Provide minimum 2-1/4-inch letters through 4-inch pipe and 4-inch letters for 5-inch pipe and larger.

C. Install identification in the following locations:
1. both sides of penetrations through walls, floors and ceilings.
2. Close to valves or flanges.
3. Intervals on straight pipe runs not to exceed 50 feet
4. Apply marker where view is obstructed.

D. Pipe markers shall meet or exceed the specifications of the ASME A13.1 “Scheme for Identification of Piping Systems”.

END OF SECTION

SECTION 23 21 13

HOT WATER AND CHILLED WATER PIPING, VALVES AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install heating water and chilled water piping, valves and appurtenances, including fittings and strainers. Domestic hot water piping is specified in the Domestic Water Piping and Appurtenances section.

1.2 RELATED WORK

A. Division 23 Mechanical:
1. Pipe and Pipe Fittings - General
2. Valves, Strainers and Vents
3. Vibration Isolation
4. Insulation

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. For pipe 2" and less in diameter, provide pipe conforming to ASTM A 53, Grade A or B, or ASTM A106 standard weight seamless, or electric-resistance welded black steel pipe. Furnish 150 lb. screwed malleable iron fittings conforming to ANSI B 16.3 for chilled water. Provide fittings conforming to ANSI B 16.4 for hot water.

B. For pipe 2-1/2" in diameter and larger, provide pipe meeting the requirements of ASTM A 53, Grade A or B, or ASTM A 106 standard weight seamless, or electric-resistance welded black steel pipe with standard weight seamless steel welded fittings, satisfying ASTM A 234, Grade WPA or WPB, ANSI B16.9.

2.2 VALVES

A. Refer to Section 23 05 23.

B. Refer to Building Management and Control System.

2.3 WATER SPECIALTIES

A. Pressurized Expansion Tanks shall be precharged steel tank with a replaceable heavy duty Butyl rubber bladder. The tank shall have a 1-1/2" system connection, drain, and a standard tire valve to facilitate on-site charging of the tank. The tank shall be fitted with lifting rings and a floor mounting skirt for vertical installation. The tank must be constructed in accordance with Section VIII of ASME Boiler and Pressure Vessel Code and stamped 125 PSI working pressure.
1. Acceptable manufacturers: Bell & Gossett, Taco, Wessels, John Wood Company, and Wheatley.

B. Air Separators shall be centrifugal type. The inlet and outlet connections shall be the same as adjoining pipe. Vessel shell diameter is to be three times the nominal inlet/outlet pipe diameter. The unit shall have an internal stainless steel air collector tube with perforations and 63% open area designed to direct accumulated air to the compression tank via a vent connection at top of unit. The air separator must be designed, constructed and stamped for 125 psig @ 350°F in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, and registered with the National Board of Boiler and Pressure Vessel Inspectors. The air separator(s) shall be painted with one shop coat of light gray air dry enamel. A Manufacturer’s Data Report for Pressure Vessels, Form U-1 as required by the provisions of the ASME Boiler and Pressure Vessel Code shall be furnished for each air separator upon request.
1. Acceptable manufacturers: Bell & Gossett, Armstrong, Taco, John Wood Company, and Wheatley.

C. Automatic Air vents shall be float actuated high capacity air vent designed to purge free air from the system and provide shutoff at pressures up to 150 psig at a maximum temperature of 250 degrees F. The design of the high capacity air vent shall prevent air from entering the system if system

pressure should drop below atmospheric pressure. The high capacity air vent shall purge free air at pressures up to 150 psig during normal system operation. The high capacity air vent shall be constructed of cast iron and fitted with components of stainless steel, brass, and EPDM.
1. Acceptable Manufacturers: Bell & Gossett, Armstrong, Taco, and Wheatley.

D. Pressure Reducing Valves shall be diaphragm operated with brass body, low inlet pressure check valve and inlet strainer. The strainer shall be easily removed without system shutdown. The valve seat, strainer, and stem must be removable and of non-corrosive material.
1. Acceptable Manufacturers: Bell & Gossett, Armstrong, Taco, and Wheatley.

PART 3 - EXECUTION

3.1 TESTING

A. Test all piping systems to assure they are absolutely leak free.

B. Apply a hydraulic pressure 1-1/2 times the operating pressure, 150 psig minimum, and check for leaks. Maintain test for a minimum of 24 hours. The piping system must remain absolutely tight during this period. The satisfactory completion of any test or series of tests will not relieve the contractor of responsibility for ultimate proper and satisfactory operation of piping systems and their accessories. The test should be observed by the Architect / Engineer before pressure is removed and water drained.

3.2 AIR HANDLING UNIT PIPING

A. Provide a minimum of 12" of straight pipe at all coil piping connections.

3.3 AIR AND AIR/DIRT SEPARATOR

A. Install full size drain to nearest floor drain.

END OF SECTION

SECTION 23 21 23

HVAC PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General characteristics for pumps specified in Division 23 - Mechanical.

1.2 RELATED WORK

Requirements for pumps are specified in other sections of Division 23 - Mechanical, including the following:

A. Division 23 Mechanical - Electrical Provisions of Mechanical Work.

1.3 PUMP SELECTION

A. Select pumps conservatively for scheduled conditions. Furnish pumps that have reasonably high efficiencies, with peak efficiency at or near rated conditions. Select pumps that will operate stably at 15' suction lift despite substantial reduction in head or substantial increase in delivery.

B. If the pumps proposed are not considered suitable, submit manufacturer's data on other pumps, for review.

C. Scheduled design flow, design head, pump efficiency, and motor horsepower are the minimum acceptable.

D. The pump curve shall rise continuously from maximum flow to cut-off.

E. Shut-off head approximately 10 percent greater than design head, unless otherwise indicated in pump schedules.

F. Pump brake horsepower shall not exceed the motor horsepower rating over the entire operating range from shut-off to run-out.

G. Select the pump for operation at or near peak efficiency.

H. Cavitation-free at all points on the curve.

I. Impeller diameter shall not exceed 90 percent of the maximum published diameter.

J. Pumps shall be suitable for parallel operation. Where pumps are operated in parallel, individual pumps shall be capable of stable operation with only one pump operating in the system. Submit pump curves with single and multiple pumps operating on system curve for approval.

1.4 PUMP SIZE AND TYPE

A. Provide motor-driven pumps of the type and speed scheduled. Select pumps that are not overloaded throughout the entire range of pump operation. Provide pump connection sizes as indicated.

B. The head capacities indicated in the schedules are listed for bidding purposes only. Calculate the operating head at each pump; take into consideration the actual routing of the various lines, pressure drops in heat exchangers and coils, exact lengths of pipe, fittings, etc. Submit these calculations, together with copies of manufacturer’s performance curves, as shop drawings on each pump. Clearly mark the curves for each pump to indicate the diameter of the impeller and the selection point.

1.5 CERTIFIED DATA

A. Submit factory certified pump curves showing pump performance characteristics with pump and

system operating points plotted. Curves shall include as a minimum, flow (gallons per minute), head (feet of water), all available impeller diameters (inches), efficiency (percent), net positive suction head required (feet of water), brake horsepower, pump size and pump model. When multiple pumps are operating in parallel, show pump curves for one pump running, two pumps running, and so on. Show pump curves with system curve plotted.

PART 2 - PRODUCTS

2.1 HORIZONTAL PUMPS

A. Pump Construction:
1. Cast iron, designed for 175 psi working pressure
2. Bronze case wear rings
3. Greased lubricated ball bearings selected for an average life of 200,000 hours.
4. Each bearing shall be provided with pressure grease fittings. All grease fitting concealed behind pump insulation shall be provided with extensions to outside of the insulation.
5. Flexible coupled
6. Hot Dipped galvanized drip-rim structural steel base extending past the pump flanges allowing all condensation to be accumulated. Galvanized integral drain pan.
7. Falk all-metal center dropout spacer coupling
8. Totally enclosed metal or high-impact polyethylene plastic (Orange Peel) coupling guard per ANSI B15.1, Section 8 and OSHA 1910.219
9. Suction and discharge flange gauge ports
10. Fully enclosed bronze impeller keyed to the shaft
11. 304 Stainless steel shaft minimum

B. End suction pump volute with integrally cast pedestal support foot for back pullout to allow pump to be serviced without disturbing the system piping. Pumps utilizing pedestal mounted bearing frames in lieu of volute will not be accepted.

C. Bearings:
1. Conform to Anti-Friction Bearing Manufacturers Association (AFBMA) Standards
2. Ball or roller bearing pillow block type
3. Self-aligning
4. AFBMA L50 rating of 200,000 hours
5. Each bearing shall be provided with pressure grease fittings. All grease fitting concealed behind pump insulation shall be provided with extensions to outside of the insulation.

D. Horizontal or vertical split case pumps: Double row grease lubricated ball bearing each side.

E. Provide each pump with an internally flushed mechanical seal. If external flush line is required, provide sediment filter for each line.
1. Use seal materials suitable for the pumped liquid
2. Renewable bronze or stainless shaft sleeve

F. Provide each pump with a stuffing box with packing:
1. Hardened 440C stainless steel renewable shaft sleeve
2. Bronze gland and stainless steel gland bolts
3. Oil graphite packing

G. Paint entire unit with two coats of machinery enamel after completion of installation.

H. Pump Motor:
1. Premium efficiency
2. Totally enclosed fan cooled
3. Cast iron frame and end plate
4. Forge steel lifting eye
5. Over sized conduit box with ground lug
6. So sized with relation to the pump impeller that the brake horsepower requirements will not overload the motor at any point on the pump curve
7. Designed for Variable Frequency Drive Application

8. Provide with factory installed shaft grounding rings by AEGIS.
9. Minimum Efficiency

3 hp	1800 rpm	89.5%
5 hp	1800 rpm	90.2%
7.5 hp	1800 rpm	91.7%
10 hp	1800 rpm	91.7%
15 hp	1800 rpm	92.4%
20 hp	1800 rpm	93%
25 hp	1800 rpm	93.6%
30 hp	1800 rpm	94.1%
40 hp	1800 rpm	94.5%
50 hp	1800 rpm	94.5%
60 hp	1800 rpm	95%
75 hp+	1800 rpm	95.4%

I. Data plates:
1. Provide the pump with a nameplate constructed of 300 series stainless steel securely fastened to pump casing with stainless steel pins.
2. Locate the nameplate for easy visibility.
3. Clearly stamp the rating conditions and other data below, as a minimum, on the nameplate.
   a. Manufacturer, address, telephone number
   b. Pump model number
   c. Pump serial number
   d. Size (including impeller diameter scheduled in inches)
   e. Type
   f. Equipment designation as listed on the pump schedule.
   g. Flow scheduled (gallons per minute)
   h. Dynamic head scheduled (feet of water)
   i. Efficiency (percent)
   j. Shut-off head (feet of water)
   k. Speed (rpm)
   l. Brake horsepower
   m. Maximum brake horsepower with rated impeller
   n. Rotation
   o. Maximum allowable pressure (psig)

J. The schedule on the drawing sets forth the type of pump and GPM required.
1. The head capacities and horsepower are for bidding purposes only.
2. Make pump selection based on actual system calculations.

K. Acceptable manufacturers:
1. Armstrong
2. Aurora
3. Bell & Gossett
4. Patterson
5. TACO

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the pumps in accordance with Manufacturer's "Installation, Start-up and Service Instructions".
1. Provide access space around pumps for service.
2. Install pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. Install stainless steel drain pan with trough under chilled water pumps only.
3. Provide air cock and drain connection piped to floor drain.
4. Lubricate pumps prior to start-up.
5. Install condenser water pumps to ensure a full flooded suction.

6. Paint entire unit with two coats of machinery enamel after completion of installation.
7. Provide a spool piece between the suction diffuser and the suction side of the pump minimum length 8" face to face.
8. Provide pressure taps with valves on each side of the pump.
9. Install hot water circulator horizontally, properly supported to wall, in an accessible location for testing and maintenance at a height not to exceed 60” above finished floor. Install line size Ernst bronze rotating wheel, flow indicator with double window, downstream of circulator.

B. Provide a line size isolation valve and strainer on the pump suction and a line size silent check valve and balancing valve on the pump discharge. Provide an automatic air vent off the pump casing. For base mounted pumps, provide a drain line the full size of the base connection and extend it to and terminate it over the nearest floor drain.

C. Support piping adjacent to the pump such that no weight is carried on the pump casing. Decrease from pipe size with eccentric reducer on suction side and concentric increaser on discharge side.

D. Ensure pumps:
1. Operate at specified system fluid temperatures without vapor binding and cavitation.
2. Are non-overloading in parallel and individual operation.
3. Operate within 25 percent of midpoint of published maximum efficiency curve.

E. Refer to pump detail on the Contract Drawings for piping accessories to be provided.

3.2 ALIGNMENT FOR BASE MOUNTED PUMPS

A. Set the pump on a concrete inertia base or concrete housekeeping pad as specified; anchor, level and grout.

B. Align the pump and driver in accordance with Hydraulic Institute Standards for centrifugal, rotary and reciprocating pumps.

C. Realign the pump and driver after initial leveling of pump base before placing the grout and again after the grout has set and the foundation bolts are tightened. Recheck the alignment after the piping has been connected.

3.3 MANUFACTURER START-UP SERVICE ALIGNMENT

A. After installation, the pumps and motors are to be aligned by the manufacturer or their representative utilizing a dial indicator. After completion, a formal report must be submitted by the Manufacturer to the Engineer prior to final acceptance. This report must include pump serial number, location, beginning and final alignment at a minimum.
1. Technicians, as required, shall be trained and experienced in the work they perform (contractor start-up / alignment is unacceptable).

B. Before starting pumps, but after connecting piping:
1. Align shafts and coupling with a precision dial indicator alignment instrument to the minimum tolerances .004 (TIR) per inch of coupling radius or as recommended by the manufacturer, whichever is the greater.
2. Tabulate the actual pump alignment reading with manufacturer's minimum tolerances.
3. Submit readings for approval.
4. Include the approved readings in the Owner's Maintenance Manual.

3.4 FINAL PUMP FLOW CALIBRATION

A. Based on the results of the final phases of the test and balance sequences, if the flow of the unthrottled pump is more than 10% above the scheduled values:
1. Request detailed instructions from the pump manufacturer for the correct impeller diameter.
2. Trim the impeller to the diameter recommended by the manufacturer, employing precision machinery.

B. Enter the information on the final configuration of the pump in the Owner's Manual.
   1. Modify the pump nameplate to reflect the correct head and flow data and the impeller diameter.

3.5 SPARE PARTS

A. Provide the following spare parts and material to the Owner for his use after the warranty period.
   1. A mechanical seal for each pump
   2. A set of bearings for each pump

END OF SECTION

SECTION 23 21 27

PAINTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies painting of mechanical items located outdoors and inside central plant. Painting includes preparing, painting and color-coding the work. Preparation and application shall be in accordance with manufacturer's instructions. Mechanical items to be painted are piping and pumps. This shall include, but not be limited to, insulated and uninsulated chilled and hot water piping, expansion tanks, air separator, and chilled and hot water pumps.

1.2 REFERENCES

A. Section 23 21 23 – Pumps

B. Section – 23 21 13 - Hot and Chilled Water Piping, Valves and Appurtenances

PART 2 - PRODUCTS

2.1 PIPING AND PUMPS

A. First Coat: One coat Devran 205 Universal Epoxy Primer.

B. Second Coat: Two coats Devthane 379UVA Aliphatic Urethane Gloss Enamel.

PART 3 - EXECUTION

3.1 GENERAL

A. Thoroughly clean surfaces receiving paint of dirt, grease, oil, rust and scale.

B. Unless otherwise specified, paint using three coast of selected colors. Mix and use exactly as specified by the manufacturer. Allow each coat to dry thoroughly before applying succeeding coats. Painting may be done by spraying where feasible.

C. Upon completion of painting, remove all scaffolds, surplus material, rags and trash to leave spaces neat and clean.

D. Items to be painted:
1. Insulated chilled water piping.
2. Insulated heating water piping
3. Expansion tanks
4. Air separator
5. Chilled and heating water pumps

3.2 COLORS

A. Hot water – Gray (Color match existing)
B. Chilled water – Blue (Color match existing)

END OF SECTION

SECTION 23 23 00

REFRIGERANT PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install copper tubing, valves, strainers and sight glass for refrigerant piping.

1.2 RELATED WORK

A. Division 23 Mechanical.
   1. Pipe and Pipe Fittings
   2. Piping Insulation

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Furnish refrigerant piping of Type K hard-drawn copper tubing with sweat-type, wrought copper fittings. Cast fittings are not permitted.

2.2 SERVICE VALVES

A. Provide angle or globe service valves, with sweat connections. Use packed-type, wrench operated, valves with gasketed seal cap and back seat feature. Furnish valves designed for refrigerant service, in conformance with the ARI code.

B. Place service valves at the inlet and outlet of each compressor, on both sides of each strainer and solenoid valve, and as otherwise shown and specified.

2.3 SOLENOID VALVES

A. Furnish pilot-operated, floating-piston solenoid valves suitable for operation with refrigerant.

B. Use valves with a bronze body and sweat-type connections.

C. Provide stainless steel stem and plunger assembly and a stainless steel piston.

D. Furnish sealed and moisture proof solenoid coils.

E. Use electrical characteristics of 115 volt, 60 Hertz.

2.4 SIGHT GLASSES

A. Provide suitable moisture and liquid sight glass in the liquid line leaving the condenser or receiver.

2.5 FILTER DRYER

A. Furnish replaceable core liquid line filter dryer.

B. Provide filter dryer constructed to permit the removal of the core element without removing the filter dryer from the line.

PART 3 - EXECUTION

3.1 BRAZING

A. During the brazing process, dry nitrogen shall be purged through the tubing to prevent oxides from forming.

3.2 PRESSURE TEST

A. After refrigeration and piping system items are installed, charge the system with dry nitrogen and test to 450 psig.
   1. Test joints with a Halide torch or an electronic leak detector.
   2. Repair leaks and retest each system until proved tight.

B. Refrigerant piping systems shall be pressure teste for strength and leak tested for tightness in accordance with the requirements of section 1110 Refrigeration Piping System Test in Chapter 11 of the 2021 International Mechanical Code after installation and before being placed in operation. Tests shall include both high and low pressure sides of each system.

3.3 EVACUATION AND DRYING

A. After refrigerant system has been pressure-tested, connect a suitable vacuum pump and evacuate piping system, including lines and equipment.
   1. Maintain a vacuum as high as practicable for long enough to evaporate the moisture in the system (at least 48 hours).
   2. Check the humidity within the system with a wet bulb indicator, and maintain the vacuum until the wet bulb temperature is reduced to -40°F. After the system has been evacuated and dried, break the vacuum by charging proper refrigerant into the system.

3.4 PIPE SIZE

A. Pipe shall be routed and sized per condensing unit manufacturer’s instructions.

3.5 MINIMUM HEIGHT

A. Exposed refrigerant piping installed in open spaces shall be installed 7’-3” or higher above finished floor.

3.6 REFRIGERANT PIPE ENCLOSURE

A. Refrigerant piping shall be protected by locating it within building elements when routed below 7’-3” above finished floor except where located within 6’-0” of the refrigerant unit.

3.7 REFRIGERANT PIPE ENCLOSURE

A. Refrigerant piping shall be protected by locating it within building elements when routed below 7’-3” above finished floor except where located within 6’-0” of the refrigerant unit.

3.8 PIPE IDENTIFICATION

A. Pipe identification shall be located at intervals not exceeding 20 feet on the refrigerant piping or pipe insulation.

B. The minimum height of the lettering of the identification label shall be ½”.

C. The identification shall indicate the refrigerant designation and safety group classification of refrigerant used in the piping system. For group A2, A3, B2, B3 refrigerants, the identification shall also include the following statement: “DANGER – Risk of Fire or Explosion.” For any group B refrigerant, the identification shall also include the following statement: “DANGER – Toxic Refrigerant.”

3.9 REFRIGERANT PIPE PROTECTION

A. Where A2L and B2L refrigerant piping is located in concealed locations where the pipe is installed in studs, joists, rafters, or similar member spaces and located less than 1.5” from the nearest edge of the member, a shield plate shall be installed for continuous protection. Protective steel shield plates having a minimum of 16 gauge shall cover the area of the pipe plus the area extending 2” or more beyond both sides of the pipe.

B. Refrigerant piping shall be installed as to prevent strains and stresses that exceed the structural strength of the pipe. Pipe must be protected from damaging resulting from vibration, expansion, contraction, and structural settlement

3.10 CONTRACTOR DECLARATION

A. Installing contractor shall issue a certificate of test to the code official for all systems containing 55 lbs or more of refrigerant. The certificate shall include the test date, name of refrigerant, test medium and the field test pressure applied to the high-pressure side and the low pressure side of the system. The certification of the test shall be signed by the installing contractor and shell be made part of the public record.

3.11 STOP VALVES

A. Stop valves shall be installed on the suction inlet and discharge outlet of each compressor or condensing unit and outlet of each liquid receiver for systems containing more than 6.6 lbs of refrigerant.

B. In addition to part A. above, stop valves are also required on the inlet of each liquid receiver and inlet of each condenser where more than one condenser is used in parallel for systems containing more than 100 lbs of refrigerant.

C. Stop valves shall be identified where their intended purpose is not obvious.

END OF SECTION

SECTION 23 25 12

FLUSHING AND CLEANING OF STEEL PIPING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01, apply to this Section.

B. Addenda issued during the bidding period that affect this section of the specifications.

1.2 WORK INCLUDED

A. Perform flushing and cleaning of the complete closed loop chilled water and hot water systems. This work shall be performed prior to circulating chilled and hot water throughout the building.

1.3 SERVICE AND SUPPLIES

A. All work shall be performed by a qualified, full-time, Flushing Contractor.
1. Specialist in the field of industrial system flushing and cleaning.

B. After the mechanical contractor has tested the piping, it shall be flushed and cleaned for service. Provide a complete water flushing and cleaning of the closed loop chilled and hot water systems as specified herein. Systems must be commissioned as clean and meet water treatment specifications.

C. All chilled water and hot water piping and related equipment shall be thoroughly flushed out with precleaning chemicals designed to remove deposits such as pipe dope, oils, loose rust, mill scale and other extraneous materials. Recommended dosages of pre-cleaner chemical products shall be furnished by water treatment supplier, added and circulated throughout the water systems. The water system shall then be diluted and final flushed thoroughly until no foreign matter is observed and total alkalinity of the water is equal to or better that that of the make-up water.

D. All temporary connections required for flushing, cleaning, purging, and circulating shall be provided by mechanical contractor. Provide suitable pipe bypasses at each coil and heat exchanger during the flushing and cleaning operation.

E. Self-contained flush unit requirements shall contain a pump or pumps connected that will meet or exceed the volume required to flush and purge the system at the required velocity rate through the largest pipe. Pump curve shall be submitted along with other important documentation for the related equipment on the unit. This will include, at minimum, filtration, flow meter(s), pressure gauges, and unit description or picture. All operators shall comply with all safety regulations of the project site. The flushing operation shall be manned continuously during the flushing process.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. PurgeRite

B. Owner or Engineer approved equivalent. Substitution request must be received as outlined elsewhere in specifications.

PART 3 - EXECUTION

3.1 FLUSHING PROCEDURE

A. PRE-FLUSH
1. Bypass loops should be installed in front of any strainers and control valves at all

equipment components. Coordinate with flushing and cleaning contractor for proper sizing and placement of bypasses and flush ports.

2. Install temporary strainer elements in front of pumps, tanks, solenoid valves, control valves, and other equipment where permanent strainers are not indicated that are not bypassed. Keep these strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blow-off valve. Strainers should be removed when a self-contained flush unit is used in conjunction with on board filtration.
3. Flush ports should be identified along with the type of high pressure hose or piping that will be used to connect to the system.
4. The water source shall be provided and identified to the flushing and cleaning contractor by the mechanical contractor and must be adequate to fill and make up water in a timely manner to the system during the flush process.
5. A water dump location source shall be provided and identified to the flushing and cleaning contractor by the mechanical contractor which is usually the sanitary.

B. CLEAR WATER FLUSH

1. Fill the piping system with clean potable water. The first flush is a clear- water flush intended to circulate water through the system and force loose debris to low point drains and flush cart filtration system. This flush should be at minimum velocity throughout the system of 5 -7 ft./sec throughout. Filtration should be at minimum, 50 microns. This flush shall continue until the system water is comparable to the make-up water. Iron content should be under 2.0 ppm.

C. CLEANING AND PASSIVATION

1. The second flush cycle is a combined flushing cycle where cleaning and passivation chemicals are introduced into the system to clean the oils and treat the inside wall of the piping system. This process will be monitored by the chemical treatment company to meet the chemical specifications of the water. The cleaning velocity should be between 3 to 5 ft./sec throughout, and the circulation time will be based on the chemical testing, but will be at minimum, 24 hours.

D. FINAL CLEAR WATER FLUSH

1. The system will be continuously flushed while discharging chemicals into the sanitary system as approved locally. As the existing treated water is being discharged, a fresh water make-up source will be utilized to ensure air is not introduced into the system. Continue to drain the system while adding domestic water to dilute the treated water. The chemical treatment company will monitor the outgoing water composition and compare the composition with the incoming water. Flush with fresh water until the conductivity is reduced to that of the make-up water and iron meets specifications. The final system water should be approved by the chemical treatment company. Filtration should be 5 microns.

E. FINAL CHEMICAL FILL

1. Once the chemical treatment company has determined the system has been brought back to the correct composition, the chemical treatment company will inject the final chemicals into the system. Once the system is filled with the final chemicals it is important the water not be left stagnant.
2. Verify satisfactory completion of clean piping and a final flushing and chemical treatment report should be submitted by field personnel. The report should include at minimum, project name, date, location, parties involved, type of pipes treated, scope summary, flows, durations, and other relevant information.
3. Cleaning chemicals, procedure, water testing, reporting, and consultation must be provided by a qualified water treatment company specializing in this type of work.

END OF SECTION

SECTION 23 25 13

CIRCULATING WATER SYSTEM CHEMICAL TREATMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide equipment, chemicals and treatment materials for the complete water treatment system.

B. Determine which chemicals to use from the results of a water sample analysis taken from the building domestic water supply.

C. Provide water treatment products, holding reservoirs, equipment and labor for testing, cleaning, flushing and dispensing products to achieve the required water quality for each system specified.
1. Closed chilled and hot water systems
2. The cooling tower condenser water system

1.2 SERVICE AND SUPPLIES

A. All work shall be performed by a qualified, full-time, Water Program Manager.
1. Specialist in the field of industrial water treatment.
2. Facilities include water analysis laboratory, development facilities and service department.

B. Provide a water treatment test set for each system (pH, alkalinity, hardness, chloride) for field use including test equipment and reagents as required for specific use with the treatment products employed.

C. Where specialized supplementary testing or control equipment is required, provide appropriate items.

D. Provide a water management and service program for a period of one year beginning at substantial completion. Make routine visits bi-weekly during first two months of operation and monthly during the remainder of the specified period.

E. Routing Services
1. Check and adjust water treatment system operation.
2. Instruct, train and advise operating personnel.
3. Check efficiency of chemicals and chemical applications.
4. Replenish chemicals and replace expendables.
5. Clean or replace filter in feeder.

F. Chemically clean the piping system.

G. Provide a complete laboratory analysis of water samples. Insert in the Owner's manuals.

H. Provide review of report figures in the field water testing.

1.3 QUALITY ASSURANCE

A. Acceptable program manager shall have:
1. Research and development facilities.
2. Regional laboratories capable of making water analysis.
3. A service department and qualified technical service representatives located within a reasonable distance of the project site.
4. Service representatives who are registered Engineers or factory-certified technicians with not less than 5 years of water treatment experience with the water treatment system manufacturer.

B. Ensure that all products, packaging, blow-down or other effluents do not violate local, state, or federal laws or regulations. Use only chemicals that are registered, when required, with the U.S. Department of Agriculture or the U.S. Environmental Protection Agency and that are labeled as

required by law.

C. Provide electrical products that have been tested, listed and labeled by Underwriters Laboratories and comply with the National Electrical Manufacturers Association Standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Worth Hydrochem of Houston

2.2 CLOSED CHILLED AND HOT WATER SYSTEM

A. By-pass filter feeders in the hot water and chilled water systems:
1. Rated at 40-gpm capacity.
2. Operating conditions: 150 psig and 250°F.
3. Quick opening cap with a Buna N-O ring seal; or 1-1/2" valve and funnel.
4. 5 micron polypropylene filter bag mounted in a perforated stainless steel holder. Filter bag shall be supported from top of feeder.
a. Filter bag and holder shall extend full length of feeder tank.
b. Bottom feed tanks are not acceptable.
5. Fabricated hot dipped galvanized steel support legs and frame. Refer to detail drawing for requirements.

6. Provide sufficient quantity of filter bags for warranty period. Minimum of six additional bags provided to owner.

B. Acceptable Manufacturers
1. Neptune Model FTS-5
2. Efficiency Dynamics FF-100.
3. J.L. Wingert Model FHC-5HD.
4. Hydro-systems HS-800
5. Vector Industries, Inc. FA-900

C. Treatment chemicals:
1. Furnished as a concentrated liquid in 5 gallon pails
2. A corrosion inhibitor of the nitrite-borate type.
3. Maintained at a nitrite residual of 600 – 800 ppm in chilled loops and 1000-1500 in hot loops.
4. With effective copper, black iron, stainless steel and aluminum corrosion inhibitors.
5. Form a protective film to prevent corrosion and scale formation.
6. Have colored dye to indicate presence.

D. Multiple chemicals used in a common system shall be compatible.

E. Flow Indicator:
1. Bronze Construction
2. Rotating Wheel
3. Line Size
4. Double Window
5. Ernst Flow Industries Model EFIE-57-3

PART 3 - EXECUTION

3.1 INSTALLATION/START-UP

A. In accordance with manufacturer's recommendations.

B. Anchor the chemical filter feeder to a concrete housekeeping pad using wedge type expansion anchors.

D. Clean and flush closed loops systems.
   1. Clear water flush systems before introducing chemical cleaners.
   2. Chemical cleaner shall be introduced into the systems to remove construction related oils, greases, threading compounds, and silt.
   3. Chemical Cleaner shall passivate and pre-film pipe system.

3.2 WATER ANALYSIS

A. The chemical treatment agency shall provide the services of a testing laboratory to perform a site water analysis. As a minimum, conduct the following tests in accordance with ASTM standards and to the satisfaction of the Owner/Architect/Engineer.
   1. Silica in water and wastewater.
   2. Acidity or alkalinity of water.
   3. Iron in water.
   4. Hardness of water.
   5. Ph of water.
   6. Particulate and Dissolved Matter, Solids or Residue in Water.
   7. Turbidity in water.
   8. Corrosivity of water in absence of heat transfer.
   9. Standard practices for sampling water.

B. Take water samples in accordance with ASTM.

C. Prepare a test report in accordance with ASTM for each of the tests conducted.

D. Submit the test reports to the Architect/Engineer.

3.3 CHEMICAL TREATMENT

A. The chemical treatment agency shall provide complete services necessary for chemically cleaning and treatment the following systems:
   1. Chilled water.
   2. Hot water.
   3. Condenser water.

B. The chemical treatment agency shall provide, but not be limited to the following:
   1. Equipment and installation.
   2. Chemicals.
   3. Analytical and testing work.
   4. Inspection.
   5. Calculations.
   6. Assistance to the trade installing the piping.
   7. Instruction to Owner.

C. Determine which chemicals to use from the results of site water analysis. Provide the chemical necessary to achieve the desired water condition.

D. Examine and supervise flushing and pipe cleaning operations and verify that the systems are clean, free of debris and rust and other construction materials before starting water treatment.

E. After the piping has been flushed, cleaned, rinsed and charged with chemicals, then start-up and operate the chemical treatment equipment to provide steady, stable characteristics for the systems treated.

F. During construction, instruct the Contractor in the field piping and wiring of chemical feeding equipment. If such piping and wiring details are not shown on the Contract Drawings, then provide all equipment, piping, wiring, instrumentation and chemicals to provide a complete and operating system without additional cost.

G. After the chemical treatment is functioning as intended, the chemical treatment agency shall demonstrate to the Architect/Engineer the chemical treatment operation.

3.4 OWNER TRAINING

A. A chemical treatment agency, in conjunction with the chemical treatment equipment manufacturer's factory representative, shall train the Owner to operate and maintain the chemical treatment system as a whole and in part for each piece of equipment.

B. Furnish to the Owner a chemical treatment administration manual covering the chemical treatment program for each of the systems treated. The manual shall include, but not be limited to:
1. Name, address and telephone number of the chemical treatment agency and each of the equipment manufacturers.
2. Operation and maintenance manuals.
3. Test reports.
4. Chemical data sheets.
5. A narrative describing the chemical treatment program for each of the systems being treated.

3.5 TESTING AND INSPECTION

A. After the systems have been accepted, the chemical treatment agency shall visit the site every month during the warranty period.

B. During each visit:
1. Check and adjust the chemical treatment equipment.
2. Check the chemistry of the treated system to confirm the chemicals are maintaining the system as intended.
3. Advise and instruct the Owner on operational changes made to the chemical treatment program.
4. Take a water sample of each system being chemically treated and have the samples tested by a testing laboratory. Prepare a report for each water sample and submit it to the Owner. Include in the test report the changes that need to be made to the chemical treatment program.
5. Maintain complete records of the treatment program for each system at the project site. Keep the records in a hardbound manual with the building manager. A second copy shall be maintained by the agency for the agency's records.

C. Routine visits must be coordinated with the Owner.

D. Send copy of monthly report to Engineer for Verification.

END OF SECTION

SECTION 23 31 13

DUCTWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct construction, support and accessories. Dimensions shown on the drawings are free area dimensions.

1.2 RELATED WORK

A. Division 23 Mechanical
1. Air Devices
2. Air Handling Units
3. Insulation
4. Terminal Units
5 Fan Coil Units
6. Fans
7. Packaged Rooftop Air Conditioners
8. Testing, Balancing and Adjusting (TAB) of Environmental Systems

B. Division 9 – Finishes, Painting and Color Coding

1.3 QUALITY ASSURANCE

A. The intent of ductwork specifications is to obtain superior quality workmanship resulting in an installation that is absolutely satisfactory in both function and appearance. Provide ductwork in accordance with the specifications for each type of service.

B. An approved contractor for this work under this division shall be:
1. A specialist in this field and have the personnel, experience, training, skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 5 systems of comparable size and type that have served their owners satisfactorily for not less than 5 years.

1.4 GUARANTEE

A. Guarantee ductwork for 1 year from the date of substantial completion. The guarantee covers workmanship, noise, chatter, whistling, or vibration. Ductwork shall be free from pulsation under conditions of operation.

1.5 CONTRACTOR COORDINATION

A. Erect ducts in the general locations shown, but conform to structural and finish conditions of the building. Before fabricating any ductwork, check the physical conditions at the job site and make necessary changes in cross sections, offsets, and similar items, whether they are specifically indicated or not.

B. Coordinate location of ductwork with structural members and Architectural drawings and requirements.

1.6 SHOP DRAWINGS AND SAMPLES

A. Submit shop drawings of all ductwork layouts, including enlarged plans and elevations of all air handling equipment, and summit details of duct fittings, including particulars such as gauge sizes, welds, and configurations prior to starting work.

B. Submit product data and sealing materials to be used.

C. Submit sound attenuation data.

D. Submit shop drawings in plan, elevation and sections, and three-dimensional view showing equipment in mechanical equipment areas.

PART 2 - PRODUCTS

2.1 STANDARDS AND CODES

A. Except as otherwise indicated, sheet metal ductwork material and installation shall comply with the latest edition of SMACNA HVAC Duct Construction Standards. Air distribution devices (such as dampers) included in this specification shall comply with the latest applicable SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems and NFPA 90A.

2.2 DUCT MATERIAL AND CONSTRUCTION

A. Except for the special ducts specified below use lock forming quality prime galvanized steel sheets or coils up to 60" wide. Stencil each sheet with gauge and manufacturer's name. Stencil coils of sheet steel throughout on 10' centers with gauge and manufacturer's name. Provide certification of duct gauge and manufacturer for each size duct.

B. Rectangular low and medium pressure duct constructed of sheet metal in accordance with the latest edition of SMACNA HVAC Duct Construction Standards.

C. Medium pressure oval and round ductwork shall be spiral seam. Spiral lock-seam SMACNA Type RL-1. Fittings shall be welded construction.
1. Galvanized

D. Low pressure round ducts shall be shop fabricated with snap lock longitudinal seams. Ducts shall be constructed for a minimum of 2" w.g. static pressure.

E. Dishwasher Hood Exhaust System: Welded 304 Stainless steel.

F. Shower Area Exhaust Systems: Welded 304 Stainless steel.

G. Kitchen exhaust duct: Welded Black steel, minimum 16 gauge

H. Natatorium Ductwork: 304 Stainless Steel

2.3 ACOUSTICAL DUCT

A. Duct and fittings:
1. Double wall acoustically treated.
2. Annular space packed with fiberglass insulation.
3. Perforated metal liner to provide specific acoustic impedance
4. Insulation 1.0 pcf. 1 inch thick
5. United McGill Acousti-K27 spiral lockseam or approved equal
6. Material as indicated below:
a. Paintable Galvanized Steel

B. Pressure rating and tests as specified for single wall ductwork.

2.4 DUCT SEALING OF SEAMS AND JOINTS

A. Follow seal classification as indicated in Table 1-2 of SMACNA "HVAC AIR DUCT LEAKAGE TEST MANUAL". Use seal class A for 4" w.g. static. All longitudinal and transverse joints and seams shall be sealed by use of a fireproof, non-hardening, and non-migrating elastomeric sealant. With the exception of continuously welded joints and machine made spiral lock seams, joints and seams made air tight with duct sealer.
1. Indoor applications – Foster 32-14
2. Outdoor applications – Foster 32-17

2.5 FLEXIBLE DUCT LOW PRESSURE

A. Construction:
   1. Continuous galvanized spring steel wire helix, with reinforced metalized cover
      a. The fabric shall be mechanically fastened to the steel helix without the use of adhesives.
   2. UL 181 Class I air duct label
   3. Reinforced vapor barrier jacket
   4. Rated for use at system pressure (6" wc minimum)
   5. Flexible duct connections from lateral taps to variable volume boxes or terminal boxes shall be rated at twice the maximum pressure rating of the medium pressure system.

B. Fire hazard classification:
   1. Flame spread rating 25 maximum.
   2. Smoke developed rating 50 maximum.

C. Thermal characteristics:
   1. R-6 BTU/hr/sq. ft./°F (when located in a conditioned plenum)
   2. R-8 BTU/HR/Sq.Ft./°F (when located in an unconditioned plenum)
   3. 2" minimum wall thickness insulation with 1" overlap

D. Acceptable manufacturers:
   1. Flexmaster
   2. Hart & Cooley
   3. Omniair
   4. Peppertree Air Solutions

2.6 FLEXIBLE DUCT MEDIUM/HIGH PRESSURE

A. The duct shall be constructed of a heavy coated fiberglass cloth fabric supported by helical wound galvanized steel. The fabric shall be mechanically fastened to the steel helix without the use of adhesives.

B. The internal working pressure rating shall be at least as follows with a bursting pressure of at least two times the working pressure:
Positive: 12" w.g.
Negative: 5" w.g.

C. The duct shall be rated for a velocity of at least 5500 fpm.

D. Suitable for operating temperature range of -20°F to +250°F.

E. Factory insulate the flexible duct with fiberglass insulation.
   1. R-6 BTU/hr/sq. ft./°F (when located in a conditioned plenum)
   2. R-8 BTU/HR/Sq.Ft./°F (when located in an unconditioned plenum)
   3. 2" minimum wall thickness insulation with 1" overlap

F. Cover the insulation with a fire retarding polyethylene vapor barrier jacket having a permeance of not greater than 0.10 perms when tested in accordance with ASTM E96, Procedure A.

G. Acceptable manufacturers:
   1. Flexmaster
   2. Omniair
   3. Peppertree Air Solutions

2.7 FIRE DAMPERS

A. Fire dampers for required wall ratings that are 95% minimum free area. Provide Type B or Type C UL dampers for low, medium and high-pressure rectangular, square or round ducts. Dampers shall be activated by a fusible link designed to react at 165°F. Install per manufactures recommendations to provide a UL assembly. Provide sealed sleeve to meet desired leakage performance.

B. Acceptable Manufacturers:

1. Ruskin
2. Prefco Products
3. Air Balance
4. Greenheck, Inc.
5. Nailor Industries
6. Pottoroff

2.8 CEILING RADIATION DAMPERS

A. Ceiling Radiation Dampers at location shown on plans constructed and tested in accordance with the current edition of UL555C of a minimum 22 gauge (0.8) blades, hinged in the center and held open with a 165° fusible link. Maximum blade height in the open position shall be 10" overall regardless of damper area. Maximum distance between blades held in the open position shall be 1-1/4" for units not requiring blade insulation and 1/4" for units with sheetrock blade insulation. Blades requiring radiation protection insulation shall utilize sheetrock. Refractory Ceramic or Mineral Wool Fiber is not allowed in the air stream. Radiation insulation outside of the air stream shall be Mineral Wool Fiber only. Ceramic Fiber Material is not approved for use. Units shall be constructed of a minimum 20-gauge (0.9) frame welded at all seams.

B. Acceptable Manufactures
1. Ruskin
2. Prefco
3. Air Balance
4. Phillips
5. Safe-Air
6. Nailor Industries

2.9 WALL LOUVERS

A. Refer to schedule on drawings. Coordinate with Architectural Drawings.

B. All louver frames shall be a minimum of 0.08" extruded aluminum. All blades shall be a minimum of 0.081" extruded aluminum. Beginning point of water penetration at 0.01 oz/sq.ft. Shall be a minimum of 800 ft/min.

C. Provide all louvers with removable aluminum bird screen with 1/4" mesh.

D. Louvers shall be AMCA-550 tested and approved.

E. Acceptable manufacturers:
1. American Warming and Ventilation
2. Arrow
3. Greenheck
4. NCA
5. Pottorff
6. Ruskin

2.10 FLUES FOR POWER EXHAUST AND HIGH EFFICIENCY BOILERS AND WATER HEATERS

A. Double wall air insulated positive pressure chimney equal to Metalbestos, Van-Packer, Schebler or Metal-Fab. Chimney shall be rated for 550°F maximum flue gas temperature and with a UL tested pressure rating of 40 inches w.c. The interior pipe shall be constructed of AL 29-4C stainless steel and the exterior pipe shall be constructed of 304 stainless steel. Stack system shall be complete with a one inch air gap between inner liner and outer cover. Chimney shall be constructed and installed per UL-1738 and NFPA-211. All accessories shall be made by the same manufacturer and designed to be a part of a positive pressure chimney system.

2.11 DUCT LINING

A. Duct lining shall be 1" thick, 1-1/2 lb. density, flexible lining coated on the air stream side to reduce attrition. Liner shall be Schuler Lina-Coustic, Certain-Teed Ultralite, or equal meeting requirements of NFPA 90-A. Provide I.A.Q. rated liner.

2.12 VOLUME DAMPERS

A. Manual balancing dampers that meet or exceed the following minimum construction standards:
1. Frame 16-gauge
2. Blades 16-gauge
3. Bearings corrosion resistant
4. Concealed linkage
5. Opposed blade dampers

B. Acceptable manufacturer:
1. Ruskin Model MD-35 or approved equal, by
2. Arrow
3. American Warming and Ventilating
4. Nailor Industries
5. Pottoroff

2.13 ACCESS DOORS

A. Round spin-in door of galvanized steel.
1. Fire proof sealing gaskets and quick fastening locking devices
2. Insulated door
3. Conform to the requirements of the NFPA
4. Identification and use of each access door
5. UL label to match the construction in which it is installed
6. Cable attached to door and outer frame
7. Low leakage Access Door

B. Acceptable Manufacturer
1. Flex master, Inspector Series
2. Approved Equal

2.14 COMBINATION FIRE/SMOKE DAMPERS

A. Combination fire/smoke dampers meeting the following requirements:
1. Each combination fire/smoke damper shall be 1-1/2 hour fire rated under UL Standard 555, 4th Edition, and shall be further classified by Underwriters Laboratories as a leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. The damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. Testing and qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be Leakage Class II.
2. The damper frame shall be a minimum of 16 gauge, galvanized steel, formed into a structural hat channel shape with tabbed corners for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be integral high surface area non-electrolytic materials construction to incorporate a friction free frame blade lap seal, or molybdenum disulfide impregnated stainless steel or bronze oilite sleeve type turning in the damper frame. The dampers shall be opposed blade type. The blades shall be constructed with a minimum of 16-gauge galvanized steel. The blade edge seal material shall be able to withstand 450°F. The jamb seals shall be flexible stainless steel compression type.
3. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures of at least 4" water gauge in the closed position, and 2,000 fpm air velocity in the open position.
4. Each combination fire/smoke damper shall be equipped with a controlled 7 to 15 second heat-actuated release device. The electric EFL shall close and lock the fire/smoke damper during test, smoke detection, power failure or fire conditions through actuator closure springs. To prevent duct and HVAC component damage, the damper shall at all times be connected to the actuator for controlled closure in not less than 7 seconds and no more than 15 seconds. Instantaneous damper closure is unacceptable. After exposure to high temperature of fire, the damper must be inspected prior to reset to ensure proper operation. Release temperature is 165°F.
5. Provide UL555S qualified electric actuator at 120 VAC.
6. Provide air-foil type blades.

B. Provide integral sleeves

C. Acceptable Manufacturers:
1. Ruskin
2. Air Balance, Inc.
3. Greenheck, Inc.
4. Nailor Industries
5. Pottoroff

2.15 SMOKE DAMPERS

A. Smoke dampers meeting the following requirements.
1. Each smoke damper shall be classified by Underwriters Laboratories as a leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. The damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. Testing and qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be Leakage Class II.
2. The damper frame shall be a minimum of 16 gauge, galvanized steel, formed into a structural hat channel shape with tabbed corners for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be integral high surface area non-electrolytic materials construction to incorporate a friction free frame blade lap seal, or molybdenum disulfide impregnated stainless steel or bronze oilite sleeve type turning in the damper frame. The dampers shall be opposed blade type. The blades shall be constructed with a minimum of 16 gauge, galvanized steel. The blade edge seal material shall be able to withstand 450°F. The jamb seals shall be flexible stainless steel compression type.
3. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures of at least 4" water gauge in the closed position, and 2,000 fpm air velocity in the open position.
4. Provide UL555S qualified electric actuator at 120 VAC.
5. Provide air-foil type blades.

B. Provide integral sleeves.

C. Acceptable Manufacturers:
1. Ruskin
2. Air Balance, Inc.
3. Greenheck, Inc.
4. Nailor Industries
5. Pottoroff

2.16 DIFFUSER FITTINGS LOW PRESSURE TAPS

A. Fitting shall meet or exceed the following minimum construction standards:
1. Conical with a base diameter two inches larger than the tap diameter.
2. Construct fitting and damper of galvanized steel in accordance with ASTM A 527, G90 finish.
   a. Fitting with a 3/16-inch high stop bead approximately 2-1/2-inches from the discharge end of the fitting
   b. Provide the fitting with a butterfly damper, damper rod, end bearings and heavy duty locking quadrant.
   c. Size the length of the straight section of the fitting to match the damper blade diameter. Center the damper blade in the straight section.
3. Match the fitting body gauge to the SMACNA duct gauge, but not less than:
   a. Through 8 inches: 26 gauge; Damper blade 22 gauge
   b. 10 inches and 12 inches: 24 gauge; Damper blade 22 gauge
   c. 14 inches and 16 inches: 22 gauge; Damper blade 22 gauge
   d. 18 inches and 20 inches: 20 gauge; Damper blade 20 gauge
4. Fasten damper blade to a 3/8 X 3/8 continuous square rod with minimum (2) galvanized U-bolts.
5. Support the damper rod to the fitting with airtight nylon end bushings / bearings.

6. Provide the damper with a self-locking regulator and handle.
7. Provide a 2” sheet metal stand-off to extend the regulator.
8. Flex duct grip area – 2 inches behind retaining bead
9. Flex duct retaining bead – 1 inch from end
10. Conical length of at least 3 inches
11. Barrel length of at least 9 inches

2.17 AUXILIARY DRAIN PANS

A. Galvanized steel, same gauge and same bracing or cross breaks as a duct with same dimensions. Sides of pan turned up to 1-1/2”, all joints soldered watertight. Pan is to be large enough to complete cover drip lines of unit.

2.18 DUCTWORK SUPPORTS ON ROOF

A. Support ductwork on roof with Portable Pipe Hanger Model PHP-D fully adjustable height and width. Base material shall be high density / high impact polypropylene with UV inhibitors and anti-oxidants. Provide with hot dip galvanized framing. Nuts and washers shall be hot dip galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use construction methods and requirements as outlined in SMACNA HVAC Duct Construction Standards as well as SMACNA Balancing and Adjusting publications, unless indicated otherwise in the specifications. Refer to details on the drawings for additional information.

B. Reinforce ducts in accordance with recommended construction practice of SMACNA. Provide additional reinforcement of large plenums as required to prevent excessive flexing and or vibration.

C. Cross break or bead sheet metal for rigidity, except ducts that are 12" or less in the longest dimension.

D. Where ducts pass through walls in exposed areas, install suitable escutcheons made of sheet metal angles as closers.

E. At locations where ductwork passes through floors, provide watertight concrete curb around penetration.

F. Support ducts where passing through floors with galvanized steel structural angles of adequate bearing surface.

G. Metal or lined ductwork exposed to view through grilles, registers, and other openings shall be painted flat black. Do not install grilles, registers, or similar items until painting is complete.

H. Fire Dampers shall be installed per manufacturer’s recommendations to create a UL rated assembly.

I. Install end bearing at all location where damper shaft penetrates duct wall.

J. Clean duct to remove accumulated dust. Ducts shall be closed on ends between phases of fabrication to assure that no foreign material enters the ducts.

K. The Contractor shall ensure that all ductwork either stored on site or installed in the building is thoroughly sealed to protect against dirt and moisture until such time that the building is deemed by the Owner to be adequately clean to allow for start-up of the associated air handling equipment. Should ductwork not be sealed as specified, then the Contractor shall have such ductwork professionally cleaned to an as-new condition at no cost to the owner.

3.2 DUCTWORK

A. Construct rectangular ducts and round ducts in accordance with the latest SMACNA HVAC Duct Construction Standards. Use the static pressure specified on the air handling unit schedule or fan

schedules as a minimum for duct construction. All ductwork between the variable volume air handling units and the terminal units shall be constructed to the medium pressure ductwork specification.

B. Provide adjustable, galvanized splitter-dampers, pivoted at the downstream end with appropriate control device at each supply duct split.

C. For branch ducts wider than 18", and when shown on drawings provide extractors with an appropriate control device at each rectangular zone or branch supply duct connection. Provide controllers for extractors. Branch ducts shall have a 45° angle in the direction of flow. Do not provide extractor at branch ducts to sidewall registers where the registers are within 10 feet of the main duct.

D. Shop manufactured curved blade scoops may be used for branch duct takeoffs up to 18" wide. Taper scoop blade to the end, to prevent any sagging that may cut into, or damage duct liner if specified during operation.
1. Construct shop manufactured scoops and splitter blades of galvanized sheet metal 2 full gauges heavier than equivalent sheet metal gauge of branch duct (up to 16 gauge).
2. Check extractors, scoops and splitter blades thoroughly for freedom of operation. Oil bearing points before installing.

E. Use pushrod operator with locking nut and butt hinges assembly.

F. Provide opposed-blade volume dampers with an appropriate control device in each of the following locations:
1. Return air ductwork
2. Outside air branch duct
3. Exhaust branch duct
4. Exhaust connections to hoods except kitchen grease hoods or equipment
5. In each zone at multi-zone unit discharge installed downstream of duct mounted re-heat coils
6. At each outside air and return air duct connection to plenum of constant volume units
7. At discharge side of constant volume boxes
8. Where otherwise indicated or required for balancing coordinate location of additional dampers required by TAB Contractor.
9. Provide multi-blade dampers when blade width exceeds 12". Provide end bearing where damper shaft penetrates duct wall.

G. Elbows:
1. Rectangular: Where square elbows are shown, or are required for good airflow, provide and install single-wall or airfoil turning vanes. Job-fabricated turning vanes, if used, shall be single-thickness vanes of galvanized steel sheets of the same gauge metal as the duct in which they are installed. Furnish vanes fabricated for the same angle as the duct offset. The use of radius elbows with a centerline radius of not less than 1-1/2 times the duct width may be provided in lieu of vaned elbows where space and air flow requirements permit.
2. Round Oval Duct. Provide elbows with a centerline radius of 1-1/2 times the duct diameter or duct width. For round ducts, furnish smooth elbows or 5 piece, 90° elbows and 3 piece, 45° elbows.

H. For control devices concealed by ceilings, furring, or in other inaccessible locations, furnish extension rods and appropriate recessed-type Young regulators, mounted on the surface of the ceiling or the furring, unless specified, or shown otherwise. Provide with chrome plated cover plates. Use only one mitered gear set for each control device.

I. Install streamline deflectors at any point where dividing a sheet metal duct around piping or where other such obstruction is permitted. Where such obstructions occur in insulated ducts, fill space inside streamliner and around obstructions with glass fiber insulation.

J. Insulated Flexible Duct:
1. Install in accordance with manufacturer's instructions, and the terms of its UL listing. Duct shall not exceed 6' in length. Make connections by use of sheet metal collars and stainless

steel circular screw clamps. Clamps shall encircle the duct completely and be tightened with a worm gear operator to the point that will provide an airtight connection without unnecessary deformation of the duct. Provide one clamp on flexible duct and one clamp on external insulation. Vapor barrier jacket shall be tucked inside to conceal insulation material.

2. Construct bends over 45° with sheet metal elbows.

K. Duct Supports:

1. Horizontal ducts up to 40". Support horizontal ducts up to and including 40" in their greater dimension by means of #18 U.S. gauge galvanized iron strap hangers attached to the ducts by a minimum of two locations per side by means of screws, rivets or clamps, and fastened to inserts with toggle bolts, beam clamps or other approved means. Place supports on at least 8' centers. Use clamps to fasten hangers to reinforcing on sealed ducts.
2. Horizontal ducts larger than 40". Support horizontal ducts larger than 40" in their greatest dimension by means of hanger rods bolted to angle iron trapeze hangers. Place supports on at least 8' centers in accordance with SMACNA Standards.
3. Support vertical ducts where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles for ducts up to 60". Above 60", the angles shall be increased in strength and sized on an individual basis considering space requirements.
4. Supports shall be suspended from structural or by independent support. Do not support from structural bridging. Upper attachments should be selected with a safety factor of 4 or 5 times actual load conditions and subject to Engineers approval. Double wrap straps over open web of joist.

L. Branch connections for medium pressure ductwork shall be made with a conical lateral. Field installed conical branch ducts shall be minimum 20-gauge galvanized sheet metal, “Everdur” welded and coated with “Galvabar”.

3.3 PLENUMS

A. Return air plenums shall be rectangular galvanized sheet metal ductwork.

B. Fabricate plenums upstream of fan of 16-gauge material.

C. Fabricate plenums upstream of filters minimum 18-gauge material.

3.4 FLEXIBLE CONNECTIONS

A. Where ducts connect to fans or air handling units that are not internally isolated, make flexible airtight connections using "Ventglas" fabric. The fabric shall be fire-resistant, waterproof and mildew resistant with a weight of approximately 30 ounces per square yard. Provide a minimum of 1/2" slack in the connections, and a minimum of 2-1/2" distance between the edges of the ducts. Also, provide a minimum of 1" slack for each inch of static pressure on the fan system. Fasten fabric to apparatus and to adjacent ductwork by means of galvanized flats or draw bands. Where connections are made in outdoor locations, seal fabric to metal with mastic.

3.5 ACCESS DOORS

A. Install ductwork access doors as noted below, arranged for convenient access. Stencil each door for specific use. Install access doors in each of the following locations:

1. Fire Dampers
2. Smoke Dampers
3. Smoke/fire Dampers
4. Outside Air Dampers
5. Duct Mounted Coils (up-stream)
6. Control Dampers

B. Size access door 1" smaller than ductwork.

1. Available Sizes: 8”, 10”, 12”, 18”, 24”

C. Construct access door air tight, and conform to recommendations of NFPA and SMACNA.

D. Demonstrate suitability of access for the intended purpose. Install multiple access doors as required.

3.6 DUCT LINING

A. Install glass fiber acoustical lining where shown on drawings. Secure to duct surfaces with Foster 85-62 / 85-60 or Childers CP-125-1 / CP-127 adhesive and sheet metal fasteners on 12" centers. Coat exposed edges and leading edges of cross-joints with adhesive.

B. Provide metal nosing that is either channeled or "Z" profiled or are integrally-formed from the duct wall securely installed over transversely oriented liner edges facing the air stream at fan discharge and at any interval of lined duct preceded by unlined duct.

C. Refer to Insulation & Liner Detail on drawings for locations requiring liner to be installed.

D. Do not install liner in multi-zone unit ductwork.

3.7 SEALING OF SEAMS AND JOINTS

A. Seal supply, return, exhaust and outside air duct systems.

3.8 FLUES

A. Provide and install flues for all gas fired equipment.

B. Refer to plans for all related locations.

C. Contractor is responsible for coordinating stack sizing, stack drains, stack test ports, stack termination fittings and all other required fittings with the selected equipment manufacturers.

D. All fittings and accessories shall be manufactured by the flue manufacturer. The flue shall be installed per manufacturer's instruction.

E. Terminate flues at height above roof to prevent flue gas from entering the building.

3.9 DISHWASHER HOOD EXHAUST SYSTEM

A. All material and fittings shall be 304 Stainless steel, welded joints, watertight construction. Grade horizontal duct 1/4" per lineal foot to drain toward the washer.

3.10 SHOWER AREA EXHAUST SYSTEM

A. All material and fittings shall be 304 Stainless steel, welded joints, watertight construction. Grade horizontal duct 1/4" per lineal foot slope down to grille connection. Install in accordance with Fig. 2-21 of SMACNA HVAC Duct Construction Standards.

3.11 KITCHEN EXHAUST DUCT

A. All material and fittings shall be minimum 16 gauge, coated black steel to prevent rusting. All seams and joints in the kitchen exhaust duct, and penetrations of the hood enclosure to its lower outermost perimeter that directs and captures grease-laden vapors and exhaust gases shall have a liquid tight continuous external weld. All ducts shall be installed without forming dips or traps that might collect residues. Provide 18" x 18" or equal area at each elbow and as required for cleaning access, in direction of air flow. UL Listed access panel shall be located on the vertical wall of the duct 1-1/2" from the bottom of duct and shall be fitted with two handles, grease and air tight fitting access door and latch. All interior surfaces of ducts shall be accessible for cleaning and inspection purposes. Duct shall maintain minimum 1/4" per lineal foot slope to the exhaust hood. Provide duct over lay at the roof curb for a complete seal. Install kitchen exhaust system per local authority. In the absence of a local authority, the requirements of the Uniform Mechanical Code and NFPA 96 shall govern.

3.12 FUME HOOD EXHAUST SYSTEM

A. All material and fittings shall be 304 stainless steel construction.

3.13 ACOUSTICAL DUCT

A. Install in the following locations:
1. Where indicated on the drawings

3.14 SCREENS

A. Furnish and install screens on all duct, fan, etc., openings furnished by the Contractor that lead to, or are, outdoors; screens shall be No. 16 gauge, one-half inch (1/2") mesh in removable galvanized steel frame. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

3.15 CONNECTIONS TO LOUVERS

A. Make watertight connections to all louvers. Ductwork behind louver shall have watertight soldered joints for a minimum of three feet and be sloped to bottom of louver. Lap duct to be over bottom louver blade where possible.

B. Where plenums are installed on inside of louver, construct such that bottom of plenum will lap over bottom blade of louver to drain any water that may enter.

3.16 PLENUMS

A. Construct plenums with galvanized steel framing members and galvanized sheet steel, cross broken and rigidly braced with galvanized angles. Gauges and bracing shall conform to SMACNA recommendations for ductwork of like sizes. Openings for fans, access doors, etc., shall be framed with galvanized steel angles.

B. Provide access doors.

3.17 AUXILIARY DRAIN PANS

A. Where coils that have a condensate drain are located above ceiling.

3.18 TESTING OF LOW PRESSURE DUCTWORK

A. Test ductwork for leaks before concealing. Maximum allowable leakage is 5% of total airflow.

B. Provide equipment necessary for performing tests, including rotary blower large enough to provide required static pressure at allowed CFM quantity, certified orifice section with proper papers, traceable serial numbers and pressure vs CFM leakage rate scale, U-tube gauge board complete with cocks, tubing, and inclined manometer for leakage rates.

C. Mains: Test mains after risers and branches are tied in and all equipment set. Close runout connections and place fan in operation. Provide pressure in mains at 1-1/2 times design pressure. Visually inspect joints. Repair leaks detected by sound or touch. Release mains for completion after joints are tight.

D. Ductwork down stream of terminal boxes, return, exhaust, and outside air ducts are to be visually inspected.

3.19 TESTING OF MEDIUM AND HIGH PRESSURE DUCT

A. As the project progresses, test the ductwork in sections.

B. Provide equipment necessary for performing tests, including rotary blower large enough to provide required static pressure at allowed CFM quantity, certified orifice section with proper papers, traceable serial numbers, and pressure vs. CFM leakage rate scale, U-tube gauge board complete with cocks, tubing, and inclined manometer for leakage rates.

C. Finally as a complete system, test ductwork at a minimum of 2.5” with a maximum allowable leakage of 1% of the total design supply airflow.

D. Test method as set forth in SMACNA "HVAC Duct Construction Standards".

END OF SECTION

SECTION 23 31 14

FABRIC AIR DISPERSION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of non-metal ductwork is indicated on drawings and by requirements of this section.

1.2 QUALITY ASSURANCE

A. Building Codes and Standards:
1. Product must be Classified by Underwriter's Laboratories in accordance with the 25/50 flame spread/smoke developed requirements of MFPA 90-A and are also classified in accordance with ICC Evaluation Service AC 167.
2. All product sections must be labeled with the logo and classification marking of Underwriter's Laboratories.
3. Product must be treated with an EPA registered antimicrobial agent.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications on materials and manufactured products used for work of this section.

B. Building Code Data: Submit UL file number under which product is Classified by Underwriter's Laboratories for both NFPA 90-A and ICC AC167.

C. Submit manufacturer's documented design support information including duct sizing, vent and orifice location, vent and orifice sizing, length, and suspension. Submit parameters for design, including maximum air temperature, velocity, pressure and fabric permeability.

D. Color selections

E. Manufacturer's recommended suspension system

1.4 WARRANTY

A. Manufacturer must provide a 10 Year Product Warranty for products supplied for the fabric portion of this system as well as a Design and Performance Warranty.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect fabric air dispersion systems from damage during shipping, storage and handling.

B. Where possible, store products inside and protect from weather. Where necessary to store outside, store above grade and enclose with a vented waterproof wrapping.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, choose one of the following:

A. DuctSox Corporation

B. Fabric-Air

C. KE Fibertec

D. Prihoda

2.2 FABRIC AIR DISPERSION SYSTEM

A. Air diffusers shall be constructed of a woven fire retardant fabric complying with the following physical characteristics:
1. Fabric Construction: 100% Flame Retardant and treated with a machine wash-able anti-microbial agent from the manufacturer.
2. Weight: 6.75 oz./yd^2 per ASTM D3776
3. Fabric Porosity: 1.5 (+2/-1) cfm/ft^2 per ASTM D737, Frazier
4. Temperature Range: 0 degrees F to 180 degrees F
5. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the flame spread/smoke developed requirements of NFPA 90-A and ICC AC 167.
6. Antimicrobial agent shall be proven 99% effective after 10 laundry cycles per AATCC Test Method 100.

B. Systems Fabrication Requirements:
1. Air dispersion and extended throws accomplished by reinforced orifices and permeable fabric. Reinforced orifices are to be installed to deep the integrity of opening and withstand laundry processes.
2. Diameter, quantity, and location of reinforced orifices to be specified and approved by manufacturer.
3. 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.
4. Inlet connection includes zipper for easy removal/maintenance.
5. Lengths to include required zippers as specified by manufacturer.
6. System to include adjustable flow devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.
7. End cap includes zipper for easy maintenance.
8. Fabric system shall include connectors to accommodate suspension system listed below.
9. Any deviation from a straight run shall be made using a gored elbow or an efficiency tee. Normal 90 degree elbows to be 5 gores with the radius of the elbow 1.5 times the diameter.

C. Systems Design Parameters:
1. Use fabric diffusers only for positive pressure air distribution components of the mechanical ventilation system.
2. Do not use fabric diffusers in concealed locations.
3. Fabric diffusers shall be designed from 0.25” water gauge minimum to 3.0” maximum, with 0.5” as the standard.
4. Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).
5. Design CFM, static pressure and diffuser length shall be designed or approved by the manufacturer.

D. Fabric Tensioning System:
1. Air diffusers shall be constructed with internal tensioning frame.
2. System shall cylindrically tension textile along the entire length of textile duct.
3. Tensioning system shall include full 360 degree tensioning and intermediate rings with quick connection spacer tubes concealed inside the fabric system.
4. Interior structure to include multiple mechanically adjustable tension devices. To provide proper textile tensioning, structural and textile system shall be configured in segments of no more than 45 feet.
5. Textile components supported solely by metal cylindrical rings.
6. Each cylindrical ring shall require vertical metal to metal vertical cable safety attachment.
7. Component options include:
a. Stainless Steel Cable
b. Adjustable Gripple Mid-Supports – incremental lengths of 5’, 10’, 15’, 20’ and 30’

PART 3 - INSTALLATION

3.1 INSTALLATION OF FABRIC AIR DISPERSION SYSTEM

A. Install approved suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.

3.2 CLEANING AND PROTECTION

A. Clean air handling unit and ductwork prior to installation of the fabric duct system. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.

B. Temporary closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.

C. If fabric duct systems become soiled during installation, they should be removed and cleaned following the manufacturers standard terms of laundry.

END OF SECTION

SECTION 23 34 16

FANS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install fans, including centrifugal, axial and propeller types, with supplemental equipment.

1.2 RELATED WORK

A. Division 23 Mechanical:
1. Ductwork
2. Vibration Isolation
3. Air Balance
4. Electrical Provisions of Mechanical Work

1.3 PERFORMANCE

A. Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage as shown. Fan capacities and characteristics are scheduled on the drawings. Provide fans capable of accommodating static pressure variations of +10% of scheduled design at the design air flow.

B. Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA), approved test codes and procedures. Supply fans with sound ratings below the maximums permitted by AMCA Standards. All fans provided must be licensed to bear the Certified Ratings Seal.

C. Statically and dynamically balance all fans.

D. Motors shall be sized so that they do not operate within the motor service factor.

E. Fans shall be capable of 120% of the scheduled air capacities.

F. All static pressures shown on schedules are external to fans. Manufacturer shall add damper and accessory losses to scheduled value before selecting fan.

1.4 SUBMITTALS

A. Submit fan performance curves with system operating point plotted on curves.

B. Submit manufacturer’s printed installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cook

B. Greenheck

C. Penn Barry Ventilator

D. Twin City Fans

2.2 PROTECTIVE COATINGS

A. Manufacturer's Standard. Apply to fans, motors and accessories, the manufacturer's standard prime coat and finish, except on aluminum surfaces or where special coatings are required.

B. Galvanizing. After fabrication of the parts, hot-dip coat surfaces that require galvanizing. Where galvanizing is specified, a zinc coating may be used. After fabrication, apply the zinc coating and air-dry the coating to 95% pure zinc. Acceptable zinc coatings include Zincilate, Sealube, Amercoat, Diametcoat, or an approved equal.

2.3 SUPPLEMENTAL EQUIPMENT

A. Motor Covers. Provide weatherproof motor covers for installations out of doors. Apply the same finish as used on the fan.

B. Belt Drives:
1. Unless otherwise specified for belt-driven fans, equip the fan motors with variable pitch sheaves. Select the sheave size for the approximate midpoint of adjustment and to provide not less than 20% speed variation from full open to full closed. Size drives for 150% of rated horsepower. Key the fan sheave to the fan shaft.
2. Nonadjustable motor sheaves may be used for motor sizes over 15 horsepower, at the Contractor's option. However, if changing a nonadjustable sheave becomes necessary to produce the specified capacity, the change must be made at no additional cost.
3. Provide belt guards and apply the same finish as used on the fan.
4. Oil and heat resistant, nonstatic type belts.
5. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty, regreasable, ball type, in a pillow block, cast iron housing, selected for a minimum L50 life in excess of 200,000 hours at maximum catalog operating speed.

C. Safety Disconnect Switch: Provide a factory-wired to motor, safety disconnect switch on each unit.

D. Relief Vents and Air Inlets: Provide vents and inlets with aluminum frames and 1/2" mesh, galvanized bird screens. Include dampers where shown.

E. Prefabricated Roof Curbs: Furnish prefabricated roof curbs as detailed. The minimum height is 14". Include a resilient pad on each roof curb so the equipment can be mounted on the top flange for proper seal. Coordinate roof slope and curb to ensure equipment is installed in level position. Provide double shell to protect insulation from damage.

F. Where motorized damper is scheduled:
1. The motor and damper are specified in the Building Management and Control System Specification.

G. All fans are to be provided with a durable, deep etched, .025" thick, factory installed aluminum identification plate with the following information. Plates are to be furnished with four mounting holes.
1. Fan mark as indicated on the Contract Drawings.
2. Serial number
3. Model number
4. Capacity (CFM) and static pressure.
5. Motor HP
6. Motor Amps
7. Manufacturer
8. Motor phase
9. Number of Belts/Make/Size
10. Motor volts

I. Utility Vent Set Fans, provide minimum ¾ inch threaded coupling drain connection at lowest point of housing.

2.4 VENTILATION AND EXHAUST FANS

A. Provide the ventilation and exhaust fans shown on the drawings.

B. Provide each motor with internal overload protection.

C. Provide each belt driven fan with approved, totally enclosed belt guard.

D. Provide approved safety screen where inlet or outlet is exposed.

E. Provide duct flanges where required for connections.

F. Furnish kitchen hood exhaust fans with vented curb extension that meets NFPA 96, cleanout port, grease tap, curb seal, drain connection and hinge kit.

G. Furnish supply fans with 1” aluminum, washable filter section.

2.5 ROOFTOP VENTILATION AND EXHAUST SYSTEMS

A. Provide the rooftop ventilation and exhaust systems shown on the drawings.

B. Provide each motor with internal overload protection.

C. Components:
1. Aluminum, stainless steel or plastic coated bird guard.
2. Screws and fasteners of stainless steel or nonferrous material.
3. All aluminum construction unless indicated otherwise on fan schedule.

D. Welded construction, corrosion resistant fasteners, minimum 16 gauge marine allow aluminum.

E. Aluminum base shall be continuously welded curb cap corners.

2.6 GRAVITY ROOF-TOP INTAKE AND RELIEF VENTS

A. Provide the rooftop intake and relief vent systems shown on the drawings.

B. Provide with aluminum, stainless steel or plastic coated bird guard.
1. Screws and fasteners of stainless steel or nonferrous material
2. All aluminum construction

C. Welded construction, corrosion resistant fasteners, minimum 16-gauge marine alloy aluminum.

D. Aluminum base shall be continuously welded curb cap corners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fans according to the manufacturer's instructions and in the locations shown on the drawings. Ensure fan location is installed at minimum distance from roof edge to meet code requirements.

B. Do not operate fans or fan powered devices for any purpose until ductwork is clean, filters in place, bearings lubricated and the fan has been run under observation.

C. Roof mounted fans and gravity roof-top intake and relief vents shall be secured to the curb with stainless steel lag screws at a minimum of 6-inches on center. Follow manufacturer’s installation instructions if they are more stringent. Install roof mounted equipment in a level position. Units shall be seated on properly sized curb. Gap between base of the fan and top of the curb shall be sealed with neoprene 1” x ¼” gasket. Gasket shall be glued or attached with pressure sensitive adhesive.

D. Install curbs and equipment in level position.

E. Ceiling mounted in-line centrifugal blowers
1. Shall be suspended from structure with 1/2-inch zinc plated all-thread rods secured to structure.
2. Provide sub-structure where required.

3. Mount bottom of fan no more than 18-inches above the finished ceiling height.

3.2 EXTRA MATERIALS

A. Provide two sets of belts for each fan, not including the set installed on the fans. Tag set to identify fan.

END OF SECTION

SECTION 23 34 18

INDUSTRIAL HIGH VOLUME LOW SPEED FANS (DIRECT DRIVE)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install an Industrial High Volume Low Speed (HVLS) ceiling mounted fans with supplemental equipment.

1.2 RELATED WORK

A. Division 23 Mechanical:
1. Building Management and Control System
2. Air Balance
3. Electrical Provisions of Mechanical Work

1.3 PERFORMANCE

A. Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage as shown. Fan capacities and characteristics are scheduled on the drawings. Provide fans capable of accommodating air volume variations of +10% of scheduled design at the design air flow.

B. Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA), approved test codes and procedures. Fans with sound ratings shall be below the maximums permitted by AMCA Standards. All fans provided must be licensed to bear the Certified Ratings Seal.

C. Statically and dynamically balance all fans.

D. Motors shall be sized so that they do not operate within the motor service factor.

1.4 SUBMITTALS

A. Submit fan drawings detailing product dimensions, weight, structural supporting points and attachment methods.

B. Submit product specification sheets on the ceiling mounted fan, specifying electrical and installation requirements, features, and benefits and controller information.

C. Submit manufacturer’s installation instructions and operation and maintenance instructions.

D. Submit documentation illustrating fan sizing, placement and performance was verified using computational fluid dynamics (CFD) analysis. Documentation shall include all input data used for CFD analysis including significant obstructions to airflow at the floor level and the actual space dimensions. Submittal shall also include results of the CFD analysis.

E. Submit all warranty information including a list of each component’s warranty coverage.

F. Mark-up a copy of the specifications, indicating in the margin of each paragraph, the following: COMPLY, DO NOT COMPLY, NOT APPLICABLE.

1.5 STORAGE/HANDLING/SHIPPING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects and factory tested.

C. The fan, fan components and accessories shall be stored in a safe, dry location until installation.

1.6 WARRANTY

A. The manufacturer shall replace any products or components defective in material or workmanship, free of charge to the customer (including transportation charges) in accordance to the following schedule.

Mechanical	15 years
Electrical	7 years
Labor	1 year

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Big Ass Fans – Powerfoil D

B. Greenheck – Amplify DS-6

B. MacroAire - AVDX

2.2 HIGH VOLUME, LOW SPEED FANS (DIRECT DRIVE)

A. Complete Unit: The fan shall be NRTL certified and built pursuant to construction guidelines set forth by UL Standard 507 and CSA Standard 22.2. The fan controller shall be compliant with FCC rules to not cause harmful interference and accept and interference received. The fan shall be designed to move an effective amount of air and provide destratification in in a variety of applications with dense floor obstructions, over an extended life. The fan and components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. The sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA.

B. Onboard Fan Control: The fan shall be equipped with an onboard fan controller which utilizes a variable frequency drive (VFD) that is prewired to the motor and factory programmed to minimize the starting and braking torques.

C. Airfoil System: The fan shall be equipped with six (6) airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers. Airfoils shall be powder coated with color per Architect. The fan shall be equipped with six (6) airfoil winglets on the ends of the airfoils. The winglets shall be molded of high density polyethylene. Winglets shall be “Safety Yellow,” but may be colored as specified by the Architect or Owner.

D. Motor: The fan motor shall be permanent magnet brushless motor rated for continuous operation at maximum speed with the capability of modulating from 0%-100% without the use of a gearbox. The motor shall be totally enclosed IP66 rated. The motor frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F minimum insulation and be capable of continuous operation in -4°F to 131°F ambient conditions. The motor shall operate from any voltage rang, single phase of three phase without adapters or customer selection.

E. Mounting Post: The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds and be powder coated for corrosion resistance and appearance. Mounting post color shall be per Architect.

F. Hub: The fan hub shall be precision cut aluminum for high strength and light weight. The hub design shall provide flexible assembly to distribute force loads experienced by the hub assembly over a large area to reduce fatigue experienced at the attachment point for the fan blade. The hub shall be secured to the output shaft of the motor by means of one aerospace grade lug nut. The hub shall incorporate a minimum of six (6) safety retaining clips made of 1/4” thick steel that shall restrain the hub/airfoil assembly.

H. Mounting System: The fan mounting system shall be designed for quick and secure installation to a

variety of structural support types. The mounting system shall accommodate adjustments after fan installation via two axes of rotation to ensure fan will hang level from structure. All components in the mounting system shall be welded construction using low carbon steel no less than 3/16” thick and be powder coated for appearance and resistance to corrosion. All mounting bolts shall be SAE Grade 8 or equivalent and rated with a minimum tensile strength of 150,000 psi. Mounting components color shall be per Architect.

I. Safety Cable: The fan shall be equipped with an upper safety cable that provides additional means of securing the fan assembly to the building structure. The safety cable shall be 3/8” diameter and fabricated of 7x19 stranded galvanized steel. The loops shall be secured with swaged Nicopress fittings, pre-loaded and tested to 3,200 lbf. Field construction of safety cables shall not be permitted.

J. Wall Mounted Controller (Multiple Fans): Each group of eight HVLS fans shall be provided with a single intuitive LED touchscreen wall mounted interface controller that is capable of controlling each fan individually or a group of fans simultaneously. The controller shall mount to a standard single or duplex outlet box. Controller shall be provided with a 150’ CAT5 cables for each fan to allow seamless communication between the wall controller and each fan’s VFD. The CAT5 cable shall provide power to the digital controller and not require an additional power source. Fan start/stop, speed, fan direction control, diagnostic, fault history, ability to configure fan parameters and fan scheduling shall be available through the wall mounted controller. In addition, the controller shall also include logic to automatically control the speed of the HVLS fan in response to the controller’s onboard temperature and humidity sensors. The digital controller shall also be BacNet compatible and equipped with Bluetooth functionality. All wall controller adjustments shall be password protected to prevent unauthorized access to settings.

K. Fire Control Panel Integration: Includes a 10–30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.

L. Guy Wires: Provide guy wires to limit the potential for lateral movement.

PART 3 – EXECUTION

3.1 INSTALLATION

A. The fan shall be installed by a factory certified installer in accordance with manufacturer’s installation instruction.

B. Fan location shall be free from obstacles such as lights, cables or other building components and have bar joists or I-beam structure to mount fan and be capable of supporting fan weight and fan operational torque. A structural engineer shall be consulted for installation methods outside the manufacturer’s recommendation and a certification submitted prior to installation.

C. The fan shall be installed so that the airfoils are a minimum of 10’ above the floor. The fan installation area must be free of obstructions such as lights, cables, sprinklers or other building structures; with the airfoils at least 2’ clear of all obstructions. The fan should not be installed where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems.

D. The fan controller shall be mounted to a flat, readily accessible surface that is free from vibration and away from foreign objects and moving equipment. mounting location shall meet all accessibility requirements.

E. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
1. The maximum fan diameter shall be 24 ft (7.3 m).
2. The HVLS fan shall be centered approximately between four adjacent sprinklers.
3. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft (0.9 m).
4. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72—National Fire Alarm and Signaling Code.

3.2 WORKMANSHIP

A. Good workmanship shall be evident in all aspects of construction and installation. Field balancing of the airfoils shall not be necessary.

END OF SECTION

SECTION 23 37 13

AIR DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install air distribution devices, including grilles, diffusers, registers, dampers, and extractors.

1.2 RELATED WORK

A. Division 23 Mechanical.
1. Ductwork.
2. Air Balance.
3. Electrical Requirements for Mechanical Work.

1.3 COOPERATION WITH OTHER TRADES

A. Coordinate this work with work under Division 26 Electrical, to ensure that intended functions of lighting and air systems are achieved.

1.4 SUBMITTALS

A. Submit product data for outlets, grilles, registers, control devices, and similar equipment for review prior to placement of purchase order.

B. Submittal shall include performance sheet for each air device type. Performance sheet shall include NC levels, throw, and total pressure loss at various air flows.

1.5 FINISHES

A. Paint exposed devices with factory standard prime coat, or factory finish coat, as specified.

PART 2 - PRODUCTS

2.1 DIFFUSERS, GRILLES AND REGISTERS - Refer to Drawing Schedule.

2.2 ACCEPTABLE MANUFACTURERS

A. Titus.

B. Krueger.

C. Nailor Industries.

D. Price

E. Metal-Aire

2.3 ACCESSORIES

A. Supply Grille Extractors. Provide supply grilles with an air control device capable of positively regulating the volume of air extracted from the supply duct.

Select extractors similar to Titus Model AG25, tight-closing in the minimum position. Include a key-operated or worm-gear adjusting mechanism to facilitate positioning from the grille opening. Where adjustment is not accessible at the grille opening, provide a square control rod equipped with a locking quadrant.

B. Mounting Frames. Provide each grille or register not equipped with a removable core with a

companion, all-purpose mounting frame constructed like grille frame to facilitate installation and removal of the grille or register without marring adjacent mounting surfaces.

1. Furnish frames with 1/2" thick sponge rubber gasket to prevent air leakage.
2. Provide a frame that neatly fits the grille. Mounting frames will not be required for grilles or registers mounted directly on exposed ductwork.

PART 3 - EXECUTION

3.1 INSPECTION

A. Do not install ceilings adjacent to fixtures until installation of fixtures, air supply assemblies, return-air blank-off strips and flexible duct have been approved. Remove and reinstall any part of the installation found incorrect.

3.2 INSTALLATION

A. Louvered diffuser outlets mount tight against the ceiling. Fasten outlets to ductwork with sheet metal screws. For perforated diffusers, attach the frame assembly by a concealed hinge assembly to an outer frame compatible with the type of ceiling on which the diffuser is installed.

END OF SECTION

SECTION 23 41 00

AIR FILTRATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install air filters and air filter gauges.

1.2 RELATED WORK

A. Division 23 Mechanical.

1.3 SUBMITTALS

A. Submit manufacturer's product data sheets and capacity information as specified.

B. Submit recommended Dirty Filter pressure drop.

PART 2 - PRODUCTS

2.1 MEDIUM EFFICIENCY AIR FILTERS

A. The owner requires flexibility with filtration methods. As the primary means of filtration provide disposable pleated type media. The filter cells shall be:
1. Pleated media.
2. Disposable type.
3. Contain not less than 4.6 sq. ft. of filtering media per square foot of face area.
4. 16 pleats per linear foot of filter.
5. 2" thick.

B. Media of reinforced nonwoven cotton fabric treated with adhesive and continuously laminated to a supporting steel wire grid conforming to the configuration of the pleats.
1. Seal the media pack in a chipboard frame.

C. Rated average dust spot efficiency of not less than 36%.
1. Average synthetic arrestance in excess of 93% when tested in accordance with the ASHRAE 52-68 test standard.

D. Filter capable of operating with variable face velocities up to 500 fpm without impairing efficiency.

E. Initial resistance to air flow:
1. 300 fpm - 0.12" WG.
2. 500 fpm - 0.28" WG.

F. UL listed with Class II rating.

G. Provide one spare set for a complete change, in original cartons, for Owner's use during the warranty period.

2.2 RENEWABLE MEDIA AIR FILTER FRAME

A. The owner requires flexibility with filtration methods. As a second means of filtration provide renewable media filter frames. The filter cells shall be:
1. Permanent frame with renewable media.
2. 18-gauge galvanized steel holding frame.
3. 11-gauge galvanized steel wire grids to support the media.
4. Front grid hinged and secured with a latch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the filters and filter gauges in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 23 52 35

GAS-FIRED MODULATING HOT WATER BOILER (Condensing)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section specifies a packaged, gas-fired, power type condensing stainless steel boiler complete with all controls and trim for indoor installation.

B. Each factory "packaged" boiler shall be complete with all components, accessories and appurtenances necessary for a complete and operable boiler as hereinafter specified. Each unit shall be furnished factory assembled with required wiring and piping as a self-contained unit. Each unit shall be readily transported and ready for installation.

C. Each factory "packaged" boiler, including pressure vessel, trim, valve trains, burner, control system, and all related components, accessories and appurtenances as herein specified shall all be assembled and furnished by the boiler manufacturer. The boiler manufacturer shall provide unit responsibility for the engineering, coordination, workmanship, performance, warranties, and all field services for each factory "packaged" boiler as specified herein. The boiler manufacturer shall be fully responsible for all components assembled and furnished by him whether or not they are of his own manufacture.

1.2 RELATED WORK

A. Division 23 - Mechanical
   1. Hot Water Piping
   2. Gas Piping
   3. Ductwork

1.3 PERFORMANCE

A. Provide performance as scheduled on drawings. Boiler shall be certified for up to 99% efficiency.

1.4 WARRANTIES

A. The boiler manufacturer shall provide a five (5) year full parts and labor warranty from date of substantial completion for each boiler.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. P-K SONIC

B. RBI Flexcore

C. Raypak X-Vers

2.2 PERFORMANCE CRITERIA

A. Each boiler shall be capable of operating continuously at rated capacity while maintaining a CSA certified efficiency of not less than 92% on 500 MBH input boilers and less and not less than 95% on larger than 500 MBH input boilers. Each boiler shall be capable of operating with a minimum outlet water temperature of 68 deg. F.

B. Boiler shall comply with ASME Section IV for 80 psig, max 200 deg. F (100 psig on 1500 MBH and larger units).

C. Fuel shall be natural gas with an assumed higher heating value of 1,030 Btu/Cu Ft and an assumed specific gravity of 0.60 (relative to air). Natural gas shall be supplied at a pressure of no less than 3.5-inch WC to the inlet gas valve. Maximum inlet gas pressure shall not exceed 14-inch WC.

D. Boilers shall be certified for low NOx by the TCEQ. NOx emissions shall not exceed 30 PPM when referenced at 3% O2 at all firing rates.

E. The burner, gas train and controls shall conform to the requirements of I.R.I. /G.E. Gap.

2.3 BOILER DESIGN

A. Each hot water boiler shall consist of a horizontal, stainless steel heat exchanger complete with trim, valve trains, burner, and boiler control system. The boiler manufacturer shall fully coordinate the boiler as to the interaction of its elements with the burner and the boiler control system in order to provide the required capacities, efficiencies, and performance as specified.

B. Each boiler heat exchanger shall be stainless steel, counter-flow design for maximum heat transfer with the multiple sections arranged in a reverse return configuration to assure balanced flow through each section

C. Contractor must, when filling the system, verify that the pH level is maintained between 6.0 and 8.5.

D. All boiler pressure parts shall be constructed in accordance with the latest revision of the ASME Boiler and Pressure Vessel Code, Section IV, and shall be so stamped.

F. Boiler heat exchanger headers shall be fabricated steel and be completely removable for inspection. Seals shall be EPDM, rated for 400 deg F service. Push nipples or gaskets between the sections are not permitted.

G. Boiler shall be enclosed with a single wall outer casing. It shall be fabricated from minimum 16-gauge carbon steel. The front and top wall shall be secured in place with ¼ -20 NC bolts (sheet metal screws are not acceptable). The complete outer casing shall be finished, inside and out, with a powder coat finish. The composite structure of the boiler combustion chamber, insulating air gap and outer casing shall be of such thickness and materials to assure an outer casing temperature of not more than 50ºF above ambient temperature when the boiler is operated at full rated load.

H. An observation port shall be located on the boiler to allow for observation of the burner flame.

I. Boiler shall have a single condensing heat exchanger. A boiler that utilizes a secondary condensing heat exchanger is unacceptable.

2.4 BOILER TRIM

A. Each boiler shall be provided with all necessary trim. Boiler trim shall be as follows:
1. Safety relief valve shall be provided in compliance with the ASME code. Contractor is to pipe to acceptable drain.
2. Water pressure-temperature gauge.
3. Primary low water flow fuel cutoff (probe type with manual reset).
4. Manual reset high limit water temperature controller.
5. Operating temperature control to control the sequential operation of the burner.
6. Separate inlet and outlet water temperature sensors capable of monitoring flow
7. Exhaust temperature sensor
8. Provide condensate neutralization kit (shipped loose).

2.5 BOILER FUEL BURNING SYSTEM

A. The boiler manufacturer shall furnish each boiler with an integral, power type, straight gas, fully

automatic fuel burner. The fuel burner shall be an assembly of gas burner, combustion air blower, valve train, and ignition system. The burner manufacturer shall fully coordinate the burner as to the interaction of its elements with the boiler heat exchanger and the boiler control system in order to provide the required capacities, efficiencies, and performance as specified.

B. Each burner shall be provided with an integral gas firing combustion head.

C. Each burner shall provide adequate turbulence and mixing to achieve proper combustion without producing smoke or producing combustibles in the flue gases.

E. Each boiler shall be provided with an integral variable speed power blower to premix combustion air and fuel within the blower. The combustion air blower shall have sufficient capacity at the rated firing rate to provide air for stoichiometric combustion plus the necessary excess air. Static and total pressure capability shall comply with the requirements of the boiler. The blower shall operate at 6000 RPM maximum without undue vibration and noise and shall be designed and constructed for exposure to temperatures normal to its location on the boiler. The operating fan speed will be tachometer sensed and be capable of being displayed at the text based display.

F. Each burner shall of the radial-fired (down-fired) type and constructed of steel with a stainless steel inner and stainless steel mesh outer screen.

G. Each boiler shall be provided with a “Full Modulating” firing control system whereby the firing rate is infinitely proportional at any firing rate between 20% and 100% as determined by the pulse width modulation input control signal. Both fuel input and air input must be sequenced in unison to the appropriate firing rate without the use of mechanical linkage.

H. The Micro Processor shall use a Proportional Integral Algorithm to determine the firing rate. The control must have the following capabilities:
1. Maintain single set point
2. Reset the set point based on outdoor air temperature.
3. Boiler shutdown based on outdoor air temperature
4. Internal dual set point program with an external switchover. (e.g. - night setback w/external clock, supplied by others)
5. Alarm relay for any for any manual reset alarm function.
6. Programmable Low Fire Delay to prevent short cycling based on a time and temperature factor for release to modulation.
7. Text Based Display showing current supply and return temperatures, current set points as well as differential set points. It must also display any fault codes whether automatically reset or manually reset.
8. Local Manual Operation.
9. Remote Control System (Building Management / Sequencer Control) - The boiler control shall be capable of accepting a 0 -10vdc remote external analog signal to control the firing rate
10. Computer (PC) interface for programming and monitoring all functions

2.6 MAIN GAS VALVE TRAIN

A. Each boiler shall be provided with an integral main gas valve train. The main gas valve trains shall be factory assembled, piped, and wired. Each gas valve train shall include at least the following:
1. Two (2) safety shutoff valves. Valves equipped with dual solenoids that can independently energized for leak testing.
2. Air – Gas ratio control (maximum inlet pressure 14-inch WC)
3. One (1) low gas pressure switch (manual reset).
4. One (1) high gas pressure switch (manual reset).
5. Two (2) pressure test ports

2.7 IGNITION SYSTEM

A. Each boiler shall be equipped for direct spark ignition

2.8 COMBUSTION AIR CONTROL SYSTEM

A. Each boiler shall be provided with an integral combustion air control system. The combustion air system shall be factory assembled. Each combustion air control system shall include at least the following:
   1. The primary control shall vary the speed of the blower based on load demand. The blower shall apply a varying negative pressure on the gas valve which will open or close to maintain zero pressure at the valve orifice, thereby increasing or decreasing the firing rate. Both the air and gas shall be premixed in the blower.
   2. One (1) low airflow differential pressure switch to insure that combustion air is supplied.
   3. High exhaust back pressure switch

2.9 BURNER CONTROL SYSTEM

A. The control system shall be supplied with a 24 VAC transformer (120 VAC, single phase, 60 hertz primary). The 120/1/60 power supply to each boiler shall be protected by a 15 Amp circuit breaker located in the MCC (supplied by contractor).

B. The boiler shall include an electric spark ignition system. Main flame shall be monitored and controlled by flame rod (rectification) system.

C. Each boiler shall be provided with all necessary controls, all necessary programming sequences, and all safety interlocks. Each boiler control system shall be properly interlocked with all safeties.

D. Each boiler control system shall provide timed sequence pre-ignition air purge of boiler combustion chamber. The combustion airflow sensor shall monitor and prove the airflow purge.

2.10 BOILER CONTROL PANEL

A. The boiler manufacturer shall provide each boiler with an integral factory prewired control panel. The control panel shall contain at least the following components, all prewired to a numbered terminal strip:
   1. One (1) burner "on-off" switch.
   2. One (1) electronic combination temperature control, flame safeguard and system control.
   3. Control circuit breaker, 5 amp
   4. All necessary control switches, pushbuttons, relays, timers, terminal strips, etc.
   5. Text Based Display Panel to adjust set points and control operating parameters. Text Based Display is to indicate burner sequence, all service codes (0-65), fan speed, boiler set point, and sensor values such as inlet, outlet, flue gas and outdoor air.

2.11 FACTORY TESTING - HYDROSTATIC

A. Each factory "packaged" boiler shall be hydrostatically tested and bear the ASME “H” stamp.

2.12 FACTORY TESTING - FIRE TESTING

A. Each factory "packaged" boiler shall be fire tested. The boiler manufacturer shall perform this fire test under simulated operating conditions, with the boiler attached to a working chimney system and with water circulating through the boiler. The manufacturer shall provide a fire test report, including fuel and air settings and combustion test results permanently affixed to the boiler.

2.13 SEQUENCE CONTROLLER

A. Boiler shall be provided with a boiler sequence controller that is capable of controlling a) one or multiple boilers, b) all condensing or all non-condensing boilers, c) combination of condensing and non-condensing boilers (hybrid system). When controlling hybrid systems, sequence controller shall sequence the lead boiler based on its condensing capabilities to provide the most efficient operation. Controller shall be capable of communicating via MODBUS protocol. Controller shall allow boiler or

boilers to operate off of a remote header sensor (header sensor provided by boiler manufacturer, installed by contractor). Controller shall be capable of allowing boiler or boilers to operate based on outdoor reset, see specification Section 23 09 33 for reset schedule. This shall be achieved by either, a) programming the controller with an outdoor air reset curve in conjunction with a separate outdoor air sensor (outdoor sensor shall be provided by boiler manufacturer, installed by contractor), b) setpoint control via 0-10 VDC analog communication with building automation system, c) setpoint control via MODBUS communication. Controller shall visually display relay status, firing rate of each boiler, header temperature, outdoor air temperature. Coordinate wiring of this controller with mechanical and control's contractor.

2.14 CARBON MONOXIDE MONITORING SYSTEM

A. Provide and install a manual reset Carbon Monoxide Detector located within the boiler room. The Carbon Monoxide Detector and the boilers shall be interlocked so that the burners will not operate when the level of CO in the room rises above 50ppm. The Carbon Monoxide detector shall disable the boiler's burner upon loss of power to the detector.

B. Carbon Monoxide Sensor with two year warranty by U.S. Draft Co. Model CGM-605 with model XB expansion module or equivalent by International Gas Detectors (IGD)
1. Provided with pre-programmed dry contacts to shut down equipment during unsafe operation.
2. NEMA 1 Enclosure
3. Complies with Texas State Boiler Code 65.603-2015
4. Additional features shall include 0-10 VDC control signal out, visual alarm and audible alarm.
5. Provide expansion board for additional equipment interlocks.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install isolation valves and unions on supply and return water lines to boiler.

B. Install strainer, drain with valve, pressure and temperature gauge on return water line to boiler.

C. Install main gas cock, drip leg and union close to boiler.

D. Install on 4" concrete pad and place into operation in accordance with manufacturer's instructions. Pipe as detailed on drawings.

F. Provide Category IV vent stack material. Mechanical contractor shall coordinate draft requirements and other venting requirements between stack supplier and boiler supplier.

G. Install boilers, piping and accessories in accordance with the manufacturer's installation instructions and state boiler code.

H. Pipe each gas relief vent to the outdoors, in accordance with the manufacturer's recommendations and the local codes.

I. Contractor must, when filling the system, verify that the pH level is maintained between 6.0 and 8.5.

J. Contractor to route condensate connection off of boiler and stack to acid neutralization kit and then to appropriate drain. Trap as required by boiler manufacturer.

3.2 BOILER MANUFACTURER STARTUP SERVICE

A. Provide factory authorized startup services to assure its proper operation.

B. Set the boiler operating and safety controls.

C. Perform a flue gas analysis at the boiler outlet. Record the following results of the analysis:

1. Carbon dioxide percent volume.
2. Oxygen percent volume.
3. Stack temperature.
4. Calculated combustion efficiency.

D. Do not operate the boiler for any reason until the factory startup service has been completed.

E. Startup procedure shall include a functional test of Carbon Monoxide Detector. Simulate an alarm condition and demonstrate the functionality of the detector shutting down the appliances. Owner/Engineer shall be present to witness test.

END OF SECTION

SECTION 23 65 28

AIR-COOLED VARIABLE SPEED ROTARY SCREW CHILLER

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and Install a packaged, electric-driven, air-cooled, water chilling unit with variable speed rotary screw compressors complete with controls.

1.2 RELATED WORK

A. Division 23 – Mechanical:
   1. Chilled Water Piping
   2. Insulation
   3. Building Management Control System
   4. Vibration Isolation.
   5. Electrical Provisions of Mechanical Work.

1.3 REFERENCES

A. ANSI/ARI 550/590 - Water Chilling Packages using the Vapor Compression Cycle.
B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
C. ANSI/ASHRAE ASHRAE 90.1-1999 Minimum Chiller Efficiency Requirements
D. ANSI/ASME SEC 8 - Boiler and Pressure Vessel Code
E. ANSI/NEMA MG 1 - Motors and Generators.
F. ANSI/UL 465 - Central Cooling Air Conditioners.
G. ANSI/AFBMA 9-1978 - Load Ratings and Fatigue Life for Ball Bearings. Bearings must have life of not less than 200,000 hours.
H. ASTM B117 - Standard Method of Salt Spray (Fog) Testing
I. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
J. ASTM A525 - Zinc (Hot-Dip Galvanized) Coatings on Sheet Steel Products
K. ASTM D1654 - Evaluation of Painted or Coated Specimens, Subjected to Corrosive Environments

1.4 PERFORMANCE

A. Provide performance as scheduled on drawings.

1.5 WARRANTY

A. The Chiller manufacturer shall provide a full machine parts, labor, and refrigerant warranty for a period of five (5) years from substantial completion.
   1. The warranty shall include, but not be limited to the compressor assemblies including motor, condensers, fans, variable frequency drives, controls, evaporator, condenser, refrigeration system and all other auxiliary components and accessories as well as refrigerant and oils in systems.
   2. In the event of failure, provide new or factory authorized rebuilt parts. Shop or job site rebuilt parts are not acceptable.
   3. On all manufacturers warranties the chiller manufacturer shall provide a factory certificate listing as a minimum chiller model, serial, and warranty information as specified above. Each chiller tag shall be provided with an individual and unique warranty certificate. Manufacturer’s representative warranty letters are not acceptable as an alternative to the original manufacturer’s certificates.
   4. The chiller manufacturer authorized service agency is required to perform any and all warranty service. Contractor warranty service is not authorized. Warranty work shall be performed with District Representative present.

1.6 SUBMITTALS

A. Submit manufacturer's certified computer generated performance and capacity data in accordance with specification requirements.

B. Submit the following information:
   1. Manufacturer's installation instructions.
   2. Minimum Circuit Ampacity.
   3. Maximum Overcurrent Protection size.
   4. Maximum conductor / Terminal Lug size.
   5. Minimum flow thru evaporator.
   6. Electrical interlocks.

C. Submit recommended clearance dimensions for air flow and service.

D. Submit coordination drawings as specified.
   1. Give consideration to adjacent structures as they affect air flow patterns.

E. Submit internal wiring diagram of Control Center.

F. Submit sequence of operation in narrative form.

G. Submit a letter stating chiller being proposed meets the efficiency requirements of Centerpoint Energy's Score Program listed in Centerpoint Energy's Design Guide: HVAC Recommendations document.

H. Mark-up a copy of the specifications, indicating in the margin of each paragraph, the following: COMPLY, DO NOT COMPLY, NOT APPLICABLE.

1.7 STORAGE/HANDLING/SHIPPING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Factory coil shipping covers shall be kept in place until installation.

C. Unit controls shall be capable of withstanding 203°F (95°C) storage temperatures in the control compartment for an indefinite period of time.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Carrier

B. Trane

C. York

2.2 COMPRESSORS

A. Provide a minimum of two independently circuited semi-hermetic direct drive, variable speed rotary screw compressors with the following:
   1. Rubber isolation pads.
   2. Crankcase heaters.
   3. Semi-hermetic motor.
   4. Oil sight glass.
   5. Load and unload solenoid valves.
   6. Discharge oil separator.

B. Provide compressor with automatic capacity reduction equipment consisting of a capacity control variable speed drive. The controls system logic must start the compressor at minimum speed for a soft start.
   1. Control to be based upon leaving chilled water.

C. Ultra-Low Sound Compressor Control: Chiller manufacturer shall provide the following attenuation package and meet scheduled maximum A-weighted sound pressure level

rating of 76dBA at 30' from the condenser coil side of chiller per AHRI. Complete sound attenuation package shall be provided regardless if scheduled dBA is met without.

1. Provide ultra-low sound blanket on a minimum of 100% coverage of each compressor, suction line, discharge line and oil separator.
2. Removable Sound Covers shall be constructed with a Silicone-fiberglass cloth outer jacket, a loaded vinyl barrier septum, fiberglass needle mat (11 lbs./ft.3 density), and a Silicone-fiberglass cloth inner jacket. The covers shall be connected together by means of a cloth straps with "D" rings and Velcro fasteners. The inner and outer jackets shall protect against UV rays, oil and water. Finished Surface Mass – 3 lbs. per sq. ft., to cover compressors and extended components for the specified chiller. Stainless steel wire tie fastening assemblies are not acceptable.
3. Provide detailed ultra-low sound acoustical data with submittal. Data shall include sound pressure rating across each octave band and A-weighted average for chiller as built with attenuation package.

2.3 CONDENSER COILS

A. Coil shall be microchannel design and shall have a series of flat tubes containing multiple, parallel flow microchannel layered between the refrigerant manifolds. Tubes shall be 9153 aluminum alloy. Tubes made of 3102 alloy or other alloys of lower corrosion resistance shall not be accepted. Long Life Alloy Microchannel shall pass 4500hr salt spray rating uncoated.

B. All aluminum brazed fin microchannel construction designed for a minimum of 350 psig working pressure and leak tested at 1.5 times the working pressure.

C. Protect all vertical or angled coil sections from hail or physical damage with corrosion resistant hail guard.

D. Chiller shall be capable of stable operation in ambient temperatures down to 15°F and temperatures up to 130°F.

E. Protect condenser coils during shipping.

F. Provide condenser coils coated with corrosion resistant epoxy utilizing a dip and bake. Coating shall be flexible and uniformly bonded to all condenser coil surfaces.

2.4 FANS AND MOTORS

A. Direct Drive Ultra Low Sound propeller type fans.
   1. Vertical discharge with sound reduction without performance degradation.
   2. Protect fan blades with a heavy-gauge wire guard.
   3. Statically and dynamically balanced
   4. Sound reduction engineered heavy-duty molded plastic blades designed to reduce airflow turbulence.
   5. All condenser fans shall have integral drives to provide variable speed for optimized efficiency.

B. Motors with built in thermal overload protection
   1. Permanently lubricated ball bearings.
   2. Weatherproof (TEAO or TEFC) motors.

2.5 EVAPORATOR

A. Provide shell and tube direct expansion cooler with:
   1. Copper tube and steel shell construction
   2. 150 psig water side working pressure
   3. ASME coded 200 psig refrigerant side working pressure
   4. Fully independent refrigerant circuit for each compressor.
   5. Serviceable construction including removable heads and field replaceable tubes.

B. Protect cooler with ambient controlled heater cable and minimum 1-1/2" thick flexible elastomeric rubber closed cell insulation. Heater cable to protect evaporator to -20ºF (-29ºC). Heater cable shall be

wrapped helically around the shell under the insulation.

C. Protect insulation and equipment from abrasion by unit enclosure.

D. After completion of successful start-up, installing contractor shall seal all openings and apply a protective aluminum sheet metal cover.

E. Provide water drain connection, vent and fittings for factory installed leaving water temperature control and low temperature cutout sensors.

F. Water connections shall be grooved or flanged.

G. Proof of flow shall be provided by the equipment manufacturer factory installed.

2.6 CASING/ENCLOSURES

A. House components in minimum 12 gauge galvanized steel frame and mounted on welded structural steel base. Hot-dip galvanized steel frame coating shall be Underwriters Laboratories Inc. (UL) recognized as G90-U, UL guide number DTHW2.

B. Unit panels, and control panels shall be finished with a baked on powder paint. Control panel doors shall have door stays.

C. Mount starters and disconnects in weatherproof panel provided with full opening access doors. Provide lockable disconnect operating handle external to panel and clearly visible from outside of unit indicating if power is on or off.

D. Casings fabricated from steel that do not have a Zinc coating conforming to ASTM A 123 or ASTM A525 shall be treated for the prevention of corrosion with a factory coating or paint system. The coating or paint system shall withstand 500 hours in a salt-spray fog test in accordance with ASTM B 117. Each specimen shall have a standard scribe mark as defined in ASTM D 1654. Upon completion of exposure, the coating or paint system shall be evaluated and rated in accordance with procedures A and B of ASTM D 1654. The rating of failure at the scribe mark shall be not less than six (average creepage not greater than 1/8"). The rating of the unscribed area shall not be less than ten (no failure). Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, conditions of application, and dry-film thickness.

E. Coated wire mesh to limit access beneath the condenser coils, cooler, and compressor section area.

F. Convenience outlet (GFIC) at control panel connected to 120-vac circuit provided for heat tracing on cooler.

G. A control power transformer shall be factory installed to provide unit control power.

2.7 REFRIGERANT CIRCUIT

A. All units shall have a separate independent refrigerant circuit for each compressor.

B. Provide for each refrigerant circuit:
1. Liquid line isolation valve.
2. Filter dryer (replaceable core type).
3. Liquid line sight glass and moisture indicator.
4. Electronic expansion valve sized for maximum operating pressure. Expansion valves with less than five years of proven field operation are not acceptable.
5. Charging valve.
6. Discharge and oil line check valves.
7. Compressor suction and discharge service valves.
8. Relief valve.
9. Full operating charge of refrigerant and oil.

2.8 CONTROL PANEL

A. The Control Center.
1. NEMA 3R weatherproof cabinet with hinged lockable outer door.
2. Control system.
3. Solid-state compressor three phase motor protection.
4. Single point field power connection points.
5. Control interlock terminals.
6. Fan motor and control circuit fuses.
7. Individual contactors for each fan motor.
8. Unit power terminal blocks for connection to remove disconnect switch.
9. Power supply terminals for evaporator heater circuit.
10. Dead front panels over line voltage.
11. Control power / circuit transformer.
12. Provide incoming power terminals, sized to accept the feeder conductors.
13. Pump output relay for chilled water pump control
14. Freeze protection and low limit control of pumps
15. Chiller run and alarm status relay cards.

B. Microprocessor control system.
1. Stage unit based on leaving water temperature control.
2. Oil differential pressure setpoints.
3. Motor protection.
4. High pressure alarm.
5. Loss of refrigerant alarm.
6. Loss of water flow alarm.
7. Freeze protection alarm.
8. Low refrigerant pressure alarm.
9. Auto start/stop switch.
10. Chilled water setpoint adjustment.
11. Anti-recycle timer.
12. Compressor run status.
13. Password protection.
14. Low water temperature safety (freeze protection).
15. Automatic pump down cycle.
16. Limit supply water temperature pull down on start up to 1° per minute.
17. Automatic lead-lag sequence change of compressors.
18. Unload the compressors if the return water is too high.
19. Compressor starts with the controlled cylinders unloaded.
20. Reset of the chilled water temperature.
21. Indicate status of safeties.
22. Non-volatile memory (EPROM) with setpoints retained with battery backup.
23. Automatic high pressure unloader to unload compressor at pressures above 375 psig.
24. Auto restart after power failure.
25. BacNET Interface
26. Alarm Relay
27. Percent of Running Load Amperage

C. Display the following information with Alphanumeric Liquid Crystal Display for outdoor viewing.
1. Supply and Return water temperature.
2. Low water temperature cutout setting.
3. Low ambient temperature cutout setting.
4. Outdoor air temperature.
5. English and Metric data.
6. Suction pressure cutout setting.
7. Each system suction pressure.
8. Each system discharge pressure.
9. Each system oil pressure.
10. Percent of full load motor current.
11. Liquid control range. (2.0 - 20°F above setpoint)
12. Liquid pull down rate sensitivity adjustment.
13. Anti-recycle timer status for each compressor.
12. Compressor starts & operating run hours.

13. Safety shutdown shall be date and time stamped.
14. Compressor run status.
15. Display data in English or metric units.

D. All control functions and information shall be available at the unit control panel or via RS 232 cable and phone modem to personal computer.

E. Chiller shall include a relay board with dry contacts for alarms to notify a Building Automation System of certain events or statues of the chiller.

F. Chiller shall include input for leaving chilled water temperature setpoint based upon a 2-10VDS or 4-20mA signal from a Building Automation System.

G. Chiller shall include input for chiller current limit setpoint based upon a 2-10VDC or 4-20mA signal from a Building Automation System.

2.9 LOW VOLTAGE VARIABLE SPEED DRIVE, UNIT MOUNTED

A. The water chiller shall be furnished with an air cooled variable speed drive (VSD) as shown on the drawings.

B. The VSD will be specifically designed to interface with the water chiller controls and allow for the operating ranges and specific characteristics of the chiller.

C. The VSD efficiency shall be 97% or better at full speed and full load. Fundamental displacement power factor shall be a minimum of 0.96 at all loads.

D. The VSD shall be solid state, microprocessor based pulse-width modulated (PWM) design. The VSD shall be voltage and current regulated. Output power devices shall be IGBTs.

E. Power semi-conductor and capacitor cooling shall be from a liquid or air cooled heatsink.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install system in accordance with manufacturer's instructions.

B. Where the chiller unit is mounted on a grade, a concrete pad shall be provided that is a minimum of 4" high and extends 6" all around the chiller.

C. Align chiller package on steel or concrete foundations.

D. Locate away from overhead restrictions. Maintain side clearances according to manufacturer's recommendations and maintain overhead clearance to allow full elimination of hot air discharge.

E. Install units on vibration isolation pads.

F. Arrange piping for easy dismantling to permit tube cleaning, removing and or repair.

G. Level chiller.

H. Provide flexible elastomeric rubber closed cell insulation to prevent condensation from occurring at cooler and suction piping. After completion of successful start-up, installing contractor shall seal all openings in insulation and apply a protective aluminum sheetmetal jacket over insulation.

3.2 CHILLER MANUFACTURER START-UP/ FIELD SERVICES

A. Provide the services of a factory trained service technician employed full time by the chiller manufacturer to start-up the system. Technicians, as required, shall be factory trained and experienced in the work they perform. (Contractor startup is unacceptable.)

B. The technicians shall utilize comprehensive report forms to document results. Sample forms shall be submitted for review prior to commencing work.

C. Upon completion of the work, the report forms shall be signed by the technicians and their supervisor and included in the final report and Owner's manual.

D. Submit four copies of the final report to the Architect/Engineer for approval within 10 working days of start-up.

E. Follow the manufacturer's start-up procedures.
1. Verify interlocks.
2. Test and verify operation of safety controls.
3. Calibrate controls.
4. Verify microprocessor based control operation.
5. Test, calibrate, and set the chilled water temperature controls.
6. Verify chilled water temperature reset sequence.
7. Verify operation of the integrated control panel.

F. Measure and record the following data:
1. Chilled water entering/leaving temperature.
2. Chilled water flow through the chiller.
3. Suction pressure/condensing pressure.
4. Suction pressure/unloading steps.
5. Air entering/leaving condenser; dry bulb temperature.
6. Outdoor ambient; dry bulb.
7. Motor nameplate voltage; phase and full load amperes.
8. Heater coil in starter (as applicable)
    a. Rating in amperes.
    b. Manufacturer's recommendation.
9. Power reading (voltage and amperes of legs at motor terminals).

G. Test and calibrate the operation of the electronic ground current sensing devices.

H. If the system has been shipped with a holding charge, provide the following:
1. Leak test.
2. Refrigerant pressure test.
3. Evacuate, dehydrate and charge.

I. Verify that accessories are installed and performing the specified functions. Insert certification in Owner's manual.

J. Instruct the Owner's operating personnel. Provide Owner with 8 hours of training prior to substantial completion.

K. Do not operate the equipment for any reason until the factory start-up service has been completed.

L. Provide a printout from the unit microcomputer control system showing the correct operation of all system controls and components.

M. Provide minimum 24-hour history log displaying accuracy of temperature control system in 15-minute intervals and documented number of compressor cycles during the 24-hour period.

3.3 OWNER TRAINING

A. The manufacturer shall provide, as part of their proposal, training for (3) three Owner representatives at the Manufacturer’s facility. The owner will provide all travel accommodations.

B. Submit a training agenda two (2) weeks prior to the proposed training session for review and approval.

C. Training shall include a combination of hands-on and classroom type training which pertains to the

purchased equipment. The training shall give the trainees the ability to completely tear down and overhaul the purchased equipment. Any and all literature, manuals or information shall be provided to the trainees.

END OF SECTION

SECTION 23 73 13

AIR HANDLING UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install air handling units with casing, fans, coils, filters, and special items.

1.2 RELATED WORK

A. Division 23 Mechanical
   1. Air Balance
   2. Ductwork
   3. Controls
   4. Electrical Provisions of Mechanical Work
   5. Air Filtration
   6. Heating and Cooling Coils
   7. Other applicable sections

1.3 PERFORMANCE

A. Unit capacities and characteristics as indicated.
   1. Units must be certified in accordance with ARI Standard 430-66.
   2. UL 1995 certification for safety including electric heat.
   3. ARI 430 listed and meet NFPA 90A requirements.

1.4 SHOP DRAWINGS

A. Indicate assembly, unit dimensions, weight loading required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

B. Submit fan performance curve for each unit:
   1. Plot fan volume against static pressure, horsepower, and efficiency.
   2. Show point of rating based on static requirements of the system.
   3. Chart of specific sound power level at each octave band center frequency.
   4. For variable volume units, plot fan volume over entire range.

C. Submit for review a unit internal static pressure loss calculation.
   1. Provide an itemized list of static pressure loss at the scheduled CFM for each unit component including and not limited to:
      a. Coils
      b. Dirty filters
      c. Fan and unit system effect
      d. Cabinet and cabinet inlet and outlet
      e. Unit mounted dampers
   2. If a unit mounted outside air pretreatment section without supply fan, “piggyback” is specified:
      a. Provide an itemized static pressure loss as indicated above.
      b. Determine losses for unit configuration, i.e. parallel or series.
      c. Include losses in the primary unit internal static pressure required by configuration.
   3. The air handling unit schedule indicates static pressure external to the unit and does not include any losses associated with the air handling equipment.

D. Mark-up a copy of the specifications, indicating in the margin of each paragraph, the following: COMPLY, DO NOT COMPLY, NOT APPLICABLE.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, condensate properly tapped, piping connections verified and leak tested, belts aligned and tensioned, all

shipping braces have been removed, and fan has been tested under observation.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inspect for transportation damage and store in a clean, dry location. Protect from weather and construction traffic.

1.5 WARRANTY

A. The manufacturer shall provide a full machine parts and labor warranty for a period of one (1) year from substantial completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Carrier

B. Temtrol

C. Trane

D. York

2.2 MISCELLANEOUS REQUIREMENTS

A. Provide factory assembled units. Large units may be shipped in sections, at contractor's option, to enable entrance to building, or for oversize shipping reasons only.

B. Furnish units with sealing and fastening hardware supplied by the manufacturer. Include written instructions needed to complete field assembly of the components.

C. Provide units designed and constructed so that coils, panels, fan housing and fans can be removed without affecting the structural integrity of the unit.

D. Unit casing panels shall be a minimum of 2” double wall construction with solid galvanized exterior and solid galvanized interior. Panels shall have a minimum thermal resistance of R-13. The casing shall not exceed 0.0042-inch deflection per inch of panel span at 1.5 times the design static pressure up to a maximum of +8 inches in all positive pressure sections and -8 inches in all negative pressure sections.

E. Provide full perimeter base rail channel under units constructed of heavy gauge galvanized steel (minimum 10 gauge) and intermediate cross members to assure unit integrity. Provide minimum size base rail to ensure proper trapping and slope of condensate drain (minimum 6 inch from bottom of drain opening).

F. Fan assembly shall be provided with 1" deflection internally mounted spring vibration isolation under the fan and motor base on units with coils less than 8 sq. ft. and 2" deflection internally mounted spring vibration isolation under the fan and motor base with coils greater than 8 sq. Ft. Units with coils over 35 sq. ft. shall have spring thrust restraints securing the fan housing to the discharge opening panel on units. Fan motor shall be internally mounted. Provide internal flex connection of fan discharge. Maximum acceptable RPM of fan shall not exceed 1000.

G. Provide factory installed removable hinged access doors in the following locations:
1. Entering side of all coils to allow for cleaning of coils on both sides of unit.
2. Each side of filter compartment to allow changing of filters from either side.
3. Each side of motor compartment to allow motor and isolation access.
4. Each side of condensate drain pan to allow for cleaning and inspection.
5. Swing the doors against the casing static pressure.

H. Provide all coil modules, including heating coil modules, with 304 stainless steel drain pans to

facilitate cleaning and maintenance of the coils. Drain pan to extend 10" minimum downstream of cooling coil.

I. Provide coils with 304 stainless steel casings, end plates, tube supports and top & bottom plates.

J. Units shall meet ASHRAE III Class 6 Low Leakage Standard. Casing shall have less than a 1% leakage rate at plus or minus 8 inches W.G.

K. Provide units with a low velocity angled filter section unless otherwise specified.

L. All units shall be provided with adequate space in the cooling coil section to allow for the installation of UVC Emitters. Cooling coil access door shall be a minimum of 12" wide.

M. Provide and install each cooling coil with a factory engineered germicidal UVC Emitter solution by Steril-Aire.
1. The UVC emitter installation shall include but not be limited to safety switches, disconnect switches and all wiring internal to air handling unit. Installation of the UVC emitter shall be field installed by a local Steril-Aire factory authorized representative under the supervision of the air handling unit manufacturer's factory authorized representative.
2. UVC emitter shall be installed downstream of the cooling coils and adjacent to drain pans.
3. Penetrations through the air handling unit cabinet shall be kept to a minimum. Any required penetrations through the unit cabinet shall be sealed per the air handling unit manufacturer's recommendation.
4. UVC emitters shall be 120V single phase electrical. All electrical connections on the exterior of the air handling unit shall be done by the electrical contractor.

N. Units with DX cooling coils shall be provided with A2L refrigerant leak dissipation system.
1. Leak dissipation system shall consist of control board and A2L sensor certified to UL 60335-2-40, integrated with unit controller.
2. System shall be designed for the life of the unit.
3. Dissipation system shall be automatic, ship pre-wired, and require no additional field connections to function.
4. Refrigerant leak sensor shall be installed in UL-certified location and orientation. Sensor shall be self-correcting and resettable. Single use refrigerant leak sensor shall not be permitted.
5. Factory-installed dissipation system shall use onboard microprocessor and include:
   a. Automatic leak detection and dissipation algorithm.
   b. Automatic reset after a dissipation event has occurred.
   c. Onboard LED with flash code to indicate current unit status and hardware failures.
   d. Depressible "Test" button to allow for a system test and recall/reset of leak detection history.
   e. 24-v dry contact alarm terminal on dissipation control board to allow for external notification of leak detection.
   f. Ability to notify BAS system of dissipation event via readable alarm point unit controller.
   g. Recallable dissipation alarm history on unit controller.
6. Dissipation control board shall be accessible via normal maintenance locations and LED shall be visible.
7. Dissipation system shall "Fail Safe" per UL requirements.
8. Dissipation shall allow smoke and building fire systems to override in case of event.

O. Each vertical air handling unit configured with the fan section mounted above or on top of the coil sections shall be provided with a factory installed fan removal rail. The fan removal rail shall be integrated in air handling unit design and construction, structurally robust to support the entire fan assembly, and facilitate the mounting of a hoist system to lift and remove fan assembly

2.3 DRAW THROUGH AIR HANDLING UNITS

A. Provided with:
1. Non-Overloading direct drive plenum fans. Provide minimum number of fans as indicated on drawings.

2. Insulated sheet metal cabinet with removable panels for access to the interior.
3. Hinged double wall doors with two-step safety handles.

B. Drive assembly:
1. Sized for 50% overload.

C. Motors and Control:
1. Totally enclosed fan cooled (TEFC) or totally enclosed air over (TEAO), Variable speed, 1750 rpm.
2. Maximum operating point of 70 Hz.
3. Minimum 90% nominal efficiency at loads of 70%-100%.
4. Premium efficiency inverter duty
5. NEMA B design, with Class B insulation, capable to operate continuously at 104 deg F without tripping overloads.
6. +/- 10% voltage utilization range to protect against voltage variation.
5. Cast iron frame and end plate
6. Forged steel lifting eye
7. Oversized conduit box with ground lug
8. Provide with factory installed shaft grounding rings by Aegis
9. Motor selected so that the brake horsepower required to deliver the design air quantity at the system static pressure will not exceed the motor nameplate rating.

D. Supply Fans:
1. Single width, single inlet, backward curved welded aluminum plenum fan.
2. Statically and dynamically balanced to a BV-3 per AMCA 204 test standard.
3. Tested after being installed in the fan sections.
4. Selected for the design air quantities and pressure of the system.
5. Mounted on a common shaft if multiple wheels.
6. The fan shall be rated in accordance with AMCA 210 for performance and AMCA 260 for sound.
7. Minimum of Class II fan.

E. Fans selected with isolation shall be internally isolated with spring isolators. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor to avoid transmission of noise and vibration through the ductwork and building structure.

F. Each direct drive fan in a multiple-fan array shall be provided with integral back flow prevention: a backdraft damper that prohibits recirculation of air in the event a fan or multiple fans become disabled. Dampers are tested and rated based on AMCA Standard 500. Dampers to be heavy duty type capable of a maximum back pressure that exceeds the design total static pressure with minimal leakage. The dampers should have a minimal total effect on airflow performance; both pressure drop when open and system effect on the fan. The damper blades and frame shall be extruded aluminum with blade edge seals locked into the blade edge. Adhesive type seals are unacceptable. AHU manufacturer responsible for providing proper spacing upstream of dampers to ensure full, uniform airflow through upstream components. For units where the damper(s) are supplied at the jobsite, the installing contractor shall contract a certified TAB contractor to verify uniform airflow thru upstream components.

G. Select fan to operate at or near its maximum efficiency point when handling the required air quantity and static pressure.

H. 304 Stainless steel condensate pan with positive slope in all directions to outlet. Line the condensate drain pan with minimum 1-1/2" waterproof insulation.

I. Fan bearings:
1. Remote grease fittings grouped on the motor access side of the unit.
2. Self-aligning.

3. Selected for an average life of 200,000 hours.

J. Insulation, vapor barriers, facings and adhesives shall have:
1. Flame spread not higher than 25.
2. Smoke developed rating not higher than 50.

K. Double wall casing construction. Construct interior casing panels with 3 lb. minimum density insulation for acoustical and condensation control.
1. Condensation on the exterior of the air handling units is not acceptable.

L. Filter section:
1. Constructed with substantial hinges.
2. Neoprene gasketing.
3. Permanent quick release latching devices.
4. Arranged to accommodate the 2" thick filters as specified.
5. Refer to section 23 41 00 Filtration specification. Units shall be provided with renewable media filter frames and configured to accept 2” disposable filters as specified. Units shall utilize 2” disposable filters throughout construction and substantial completion.

M. Cooling coils as specified. Extend drain and vent piping through cabinets. Provide grommets at all pipe penetrations through cabinets.

N. Heating coils as specified. Extend drain and vent piping through cabinets. Provide grommets at all pipe penetrations through cabinets.

O. Provide units with factory fabricated mixing box section that include an additional 2” thick metal perforated inner liner which utilizes fiberglass insulation. Liner shall be installed on all walls and top surface.

P. Provide each fan section with an additional 2” thick perforated metal inner liner which utilizes fiberglass insulation. Liner shall be installed on all walls and top surface.

Q. Factory dynamic fan balancing shall be conducted from 16Hz to 60Hz to identify and eliminate critical speeds to ensure stable operation through the entire operating range of the fan and drive assembly. Field fan balancing is not acceptable. Forward factory balancing test report to Engineer upon request.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air handling units according to manufacturer's instructions.

B. Provide additional drive packages as required by the Testing and Balancing firm.

C. Air leaks detectable by sound or touch are to be corrected.

D. Air handling units are to be properly supported to prevent flexing, bending, or distorting base rails.

E. All coils are to be cleaned prior to substantial completion if units are used during construction.

F. Clean all air handling units and return to original manufacturer's condition prior to substantial completion. Vacuum clean all debris from inside air handling equipment.

G. Install piping to unit with full size 6-inch-long dirt leg with 1/2" valve at bottom for cleaning.

H. Provide for positive gravity drainage of coil condensate. Pipe full size of unit connection.

I. Adjust fan drives as required to obtain scheduled capacities as directed by the Test and Balance Firm to include sheave and belt replacement.

J. Align belts to eliminate wear and vibration of belts.

K. Verify correct drainage of condensate from condensate pan.

L. Verify correct rotation of fan and wiring of motor.

M. Lubricate all greaseable ball bearings with manufacturer's suggested lubricant.

N. Replace filters as required if units are used during construction.

O. Provide piping installation so that after piping is completed and insulated there is full access to service unit and remove fan housing. Piping to coils shall not block fan section access or cause damage to piping insulation during access.

P. AHU Installation Within Existing Building
   1. Access and Dimensional Requirements
      a. The largest section of each AHU shall be sized to pass through existing exterior door openings without removal of any factory-installed, tested, and balanced components.
      b. AHU sections must be dimensioned to fit through mezzanine access points without requiring structural modifications to the building.
   2. Manufacturer Scope of Work
      a. Any dismantling and reassembly of AHU components shall be performed solely by the AHU manufacturer.
      b. The manufacturer shall ensure that all reassembled units maintain original factory performance standards, including fan balance and component alignment.
   3. Shipping and Handling
      a. AHUs shall be shipped to the project site in preassembled sections sized for site access constraints.
      b. Each section shall be clearly labeled and packaged to facilitate efficient handling and installation.
   4. Contractor Responsibilities and Inspection Procedures
      a. The contractor shall coordinate delivery schedules with the manufacturer to ensure timely access to the site and minimize disruption to other trades.
      b. The contractor shall verify that all AHU sections received match the approved submittals and are free from damage prior to installation.
      c. The contractor shall provide necessary equipment and labor to move AHU sections into position, following manufacturer guidelines.
      d. Upon completion of reassembly by the manufacturer, the contractor shall witness and document final inspection and testing, including verification of airflow balance and mechanical integrity.
      e. Any discrepancies or damage observed during handling or installation shall be reported immediately to the manufacturer and project manager for resolution.

3.2 IDENTIFICATION

A. Furnish each unit with a durable, deep etched, .025" thick, factory installed aluminum identification plate, permanently mounted with the following information:
   1. Unit identification as indicated on Contract Drawings.
   2. Serial Number.
   3. Model Number.
   4. Capacity (CFM) and static pressure.
   5. Motor HP.
   6. Unit power supply: Volts / PH / Amps.
   7. Supply Fan Type.
   8. Coil GPM and pressure drop.
   9. Sales Order #.
   10. Date unit manufactured.

END OF SECTION

SECTION 23 81 24

WEATHERPROOF ROOF-MOUNTED AIR HANDLING UNIT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Weatherproof roof-mounted draw through single zone and variable air volume air handling units and related roof curb. Units shall be constructed for outdoor installation.

1.2 RELATED WORK

A. Division 23 Mechanical
1. Air Balance
2. Ductwork
3. Controls
4. Electrical Provisions of Mechanical Work
5. Air Filtration
6. Heating and Cooling Coils
7. Other applicable sections

1.3 SHOP DRAWINGS

A. Indicate assembly, unit dimensions, weight loading required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

B. Submit fan performance curve for each unit:
1. Plot fan volume against static pressure, horsepower, and efficiency.
2. Show point of rating based on static requirements of the system.
3. Chart of specific sound power level at each octave band center frequency.
4. For variable volume units, plot fan volume over entire range.

C. Submit for review a unit internal static pressure loss calculation.
1. Provide an itemized list of static pressure loss at the scheduled CFM for each unit component including and not limited to:
a. Coils
b. Dirty filters
c. Fan and unit system effect
d. Cabinet and cabinet inlet and outlet
e. Unit mounted dampers
2. The air handling unit schedule indicates static pressure external to the unit and does not include any losses associated with the air handling equipment.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, condensate properly tapped, piping connections verified and leak tested, belts aligned and tensioned, all shipping braces have been removed, and fan has been tested under observation.

1.5 DELIVERY, STORAGE AND HANDLING

A. Inspect for transportation damage and store in a clean, dry location. Protect from weather and construction traffic.

1.6 CAPACITY

A. Refer to equipment schedule.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Carrier

B. Trane

C. Temtrol

D. York

2.2 MISCELLANEOUS REQUIREMENTS

A. Provide factory assembled units. Large units may be shipped in sections, at contractor's option, for installation ease, or for oversize shipping reasons only.

B. Furnish units with sealing and fastening hardware supplied by the manufacturer. Include written instructions needed to complete field assembly of the components.

C. Provide units designed and constructed so that coils, panels, fan housing and fans can be removed without affecting the structural integrity of the unit.

D. Fan assembly shall be provided with 1" deflection internally mounted spring vibration isolation under the fan and motor base on units with coils less than 8 sq. ft. and 2" deflection internally mounted spring vibration isolation under the fan and motor base with coils greater than 8 sq. Ft. Units with coils over 35 sq. ft. shall have spring thrust restraints securing the fan housing to the discharge opening panel on units. Fan motor shall be internally mounted. Provide internal flex connection of fan discharge.

E. Provide all coil modules, including heating coil modules, with stainless steel drain pans to facilitate cleaning and maintenance of the coils. Drain pan to extend 10” minimum downstream of cooling coil.

F. Provide coils with stainless steel casings, end plates, tube supports and top & bottom plates.

G. Type 304 Stainless steel condensate pan with positive slope in all directions to outlet. 2” foam filled double wall construction with welded corners.

H. Insulation, vapor barriers, facings and adhesives shall have:
1. Flame spread not higher than 25.
2. Smoke developed rating not higher than 50.

I. Units shall meet ASHRAE III Class 6 Low Leakage Standard. Casing shall have less than a 1% leakage rate at plus or minus 8 inches W.G.

J. Provide units with a low velocity angled filter section unless otherwise specified.

2.3 UNIT HOUSING

A. Unit casing panels shall be a minimum of 2” double wall construction with solid galvanized exterior and solid galvanized interior. Panels shall have a minimum thermal resistance of R-13. The casing shall not exceed 0.0042-inch deflection per inch of panel span at 1.5 times the design static pressure up to a maximum of +8 inches in all positive pressure sections and -8 inches in all negative pressure sections.

B. Unit casing shall include:
1. Unitized structural steel frame and base with gusseted corners.
2. Braced and of sufficient strength to prevent "breathing".
3. Construct to accommodate the weight of a 250 lb. man at any location on the top.
4. Completely weatherproof and sloped for drainage.
5. Make casing joints water tight with approved sealant.
6. Provide gasketing around the perimeter of all panels to assure air-tight integrity.

C. Provide factory installed full size, gasketed, removable, hinged access doors in the following

locations:
1. Entering side of all coils to allow for cleaning of coils on both side of unit.
2. Each side of filter compartment to allow changing of filters from either side.
3. Each side of motor compartment to allow motor and isolation access.
4. Each side of condensate drain pan to allow for cleaning and inspection.
5. Swing the doors against the casing static pressure.

D. Provide doors for motor and filter compartments with door swing away from piping connections.

E. Provide full perimeter base rail channel under units constructed of heavy gauge galvanized steel (minimum 10 gauge) and intermediate cross members to assure unit integrity. Provide minimum size base rail to ensure proper trapping and slope of condensate drain (minimum 6 inch from bottom of drain opening).

F. All external unit surfaces shall be primed and painted with a minimum 1.5 mil enamel finish. Exterior of unit shall be weatherproof and shall be able to withstand a salt spray test in accordance with ASTM B117 for a minimum of 500 consecutive hours. Color shall be manufacturer's standard color.

G. Use stainless steel fasteners with stainless steel piano hinges; latches with zinc plated, epoxy coated T-bar handles; and air tight gaskets.

J. Double wall casing construction. Construct interior casing panels with 3 lb. minimum density insulation for acoustical and condensation control.
1. Condensation on the exterior of the air handling units is not acceptable.

2.4 SUPPLY FANS

A. Supply Fans:
1. Single width, single inlet, backward curved welded aluminum plenum fan.
2. Statically and dynamically balanced to a BV-3 per AMCA 204 test standard.
3. Tested after being installed in the fan sections.
4. Selected for the design air quantities and pressure of the system.
5. The fan shall be rated in accordance with AMCA 210 for performance and AMCA 260 for sound.
6. Minimum of Class II fan.
7. Non-Overloading direct drive plenum fans. Provide minimum number of fans as indicated on drawings.
8. Hinged double wall doors with two-step safety handles.

B. Fan bearings:
1. Remote grease fittings grouped on the coil connection side of the unit.
2. Self-aligning.
3. Selected for an average life of 200,000 hours.

C. Fans selected with isolation shall be internally isolated with spring isolators. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor to avoid transmission of noise and vibration through the ductwork and building structure.

D. Each direct drive fan in a multiple-fan array shall be provided with integral back flow prevention: a backdraft damper that prohibits recirculation of air in the event a fan or multiple fans become disabled. Dampers are tested and rated based on AMCA Standard 500. Dampers to be heavy duty type capable of a maximum back pressure that exceeds the design total static pressure with minimal leakage. The dampers should have a minimal total effect on airflow performance; both pressure drop when open and system effect on the fan. The damper blades and frame shall be extruded aluminum with blade edge seals locked into the blade edge. Adhesive type seals are unacceptable. AHU manufacturer responsible for providing proper spacing upstream of dampers to ensure full, uniform airflow through upstream components. For units where the damper(s) are

supplied at the jobsite, the installing contractor shall contract a certified TAB contractor to verify uniform airflow thru upstream components.

E. Select fan to operate at or near its maximum efficiency point when handling the required air quantity and static pressure.

F. Nominal fan outlet velocities shall not exceed 1800 FPM.

G. Provide each fan section with an additional 2” think perforated metal inner liner which utilizes fiberglass insulation. Liner shall be installed on all walls and top surface.

2.5 FAN MOTOR

A. Motors and Control:
1. Totally enclosed, fan cooled, Variable speed, 1750 rpm.
2. Maximum operating point of 70 Hz.
3. Minimum 90% nominal efficiency at loads of 70%-100%.
4. Premium efficiency inverter duty
5. NEMA B design, with Class B insulation, capable to operate continuously at 104 deg F without tripping overloads.
6. +/- 10% voltage utilization range to protect against voltage variation.
5. Cast iron frame and end plate
6. Forged steel lifting eye
7. Oversized conduit box with ground lug
8. Provide with factory installed shaft grounding rings by Aegis

B. Select the motor so the brake horsepower required to deliver the design air quantity at the system static pressure will not exceed the motor nameplate rating.

C. Select motor to operate at or near its maximum efficiency point when handling the required air quantity and static pressure.

D. Factory dynamic fan balancing shall be conducted from 16Hz to 60Hz to identify and eliminate critical speeds to ensure stable operation through the entire operating range of the fan and drive assembly. Field fan balancing is not acceptable. Forward factory balancing test report to Engineer upon request.

2.6 FILTER SECTION

A. Filter section:
1. Constructed with substantial hinges.
2. Neoprene gasketing.
3. Permanent quick release latching devices.
4. Arranged to accommodate the 2" thick filters as specified.
5. Refer to section 23 41 00 Filtration specification. Units shall be provided with renewable media filter frames and configured to accept 2” disposable filters as specified. Units shall utilize 2” disposable filters throughout construction and substantial completion.

2.7 COILS

A. Reference coil section of specifications.

2.8 OUTSIDE AIR DAMPER

A. Provide outside air damper and outside air hood component. A motorized outside air damper actuator shall be provided in the Building Management and Controls specification.
1. Storm proof louvers

B. Opposed blade dampers for 2 position and modulating control.
1. Ruskin Model CD 60

2.9 EXTERNAL PIPE CABINET

A. External Pipe Cabinet shall be:
   1. Factory assembled and integral to air handling unit.
   2. External of unit with a minimum depth of 24”
   3. Hinged 30-inch wide access doors of same construction on the front of pipe cabinet.

2.10 ROOF CURB

A. Install a welded insulated roof curb with a solid base that includes acoustical reduction material.
   1. Curb shall to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.
   2. Use a design complying with National Roofing Contractors Association requirements.
   3. Level curb according to manufacturer's recommendations.
   4. Curb height shall be a minimum of 14".
   5. Roof curb shall include integral pipe cabinet portion and be integral to the curb assembly.
   6. The assembly of the unit and roof curb shall be rated for 150 MPH winds. Provide engineered drawings certifying this requirement is met.
   7. Curb shall be solid bottom, acoustical type, with a minimum 2” fiberglass insulation.

2.11 IDENTIFICATION

A. Furnish each unit with a durable, deep etched, .025” thick, factory installed aluminum identification plate, permanently mounted with the following information:
   1. Unit identification as indicated on Contract Drawings.
   2. Serial Number.
   3. Model Number.
   4. Capacity (CFM) and static pressure.
   5. Motor HP.
   6. Unit power supply: Volts / PH / Amps.
   7. Supply Fan Type.
   8. Coil GPM and pressure drop.
   9. Sales Order #.
   10. Date unit manufactured.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air handling units according to manufacturer's instructions.

B. Provide additional drive packages as required by the Testing and Balancing firm.

C. Air leaks detectable by sound or touch are to be corrected.

D. Air handling units are to be properly supported to prevent flexing, bending, or distorting base rails.

E. All coils are to be cleaned prior to substantial completion if units are used during construction.

F. Clean all air handling units and return to original manufacturer's condition prior to substantial completion. Vacuum clean all debris from inside air handling equipment.

G. Install piping to unit with full size 6-inch-long dirt leg with 1/2" valve at bottom for cleaning.

H. Provide for positive gravity drainage of coil condensate. Pipe full size of unit connection.

I. Adjust fan drives as required to obtain scheduled capacities as directed by the Test and Balance Firm to include sheave and belt replacement.

K. Verify correct drainage of condensate from condensate pan.

L. Verify correct rotation of fan and wiring of motor.

M. Lubricate all greaseable ball bearings with manufacturer’s suggested lubricant.

N. Replace filters as required if units are used during construction.

O. Provide piping installation so that after piping is completed and insulated there is full access to service unit and remove fan housing. Piping to coils shall not block fan section access or cause damage to piping insulation during access.

3.2 STARTUP

A. Provide the services of a factory trained service technician employed full time by the unit manufacturer to start-up the system, or manufacturer's factory authorized representative under the supervision of the factory trained service technician. Upon completion of the installation, the system shall be started and commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system. The factory authorized representative will verify that accessories are installed and performing the specified functions. (Contractor startup is unacceptable.)

B. The written startup report shall be provided to the owner and engineer upon completion.

END OF SECTION

SECTION 23 82 16

HEATING AND COOLING COILS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install heating and cooling coils.

1.2 SUBMITTALS

A. Submit manufacturer's product data sheets and unit capacity information as specified.

B. Submit manufacturer's Installation, Start-Up and Service Instructions.

C. Submit internal wiring diagram.
1. Electrical interlocks. *

1.3 RELATED WORK

A. Division 23 Mechanical.
1. Air Handling Units.
2. Fan Coil Units.
3. Weatherproof Roof Mounted Air Handling Units.
4. Ductwork.
5. Terminal Boxes.

PART 2 - PRODUCTS

2.1 HOT WATER COILS

A. Hot water coils:
1. Constructed of copper tubes and aluminum fins.
2. Designed and circuited for hot water.
a. Maximum temperature 200°F.

B. Where coils are installed in fan powered VAV boxes, unit heaters and other locations where the incoming air is not filtered, the maximum approved fin spacing is 8 fins per inch.

C. Non-trapping circuit design:
1. Working pressure 200 psi
2. Tappings for drain and air vent

D. Provide a Peterson Pete's Plug with retainer strap on the inlet and outlet of each coil.
1. Positioned to permit accurate pressure readings.

E. Coils shall be constructed in casings as required for installation.

2.2 CHILLED WATER COILS

A. Chilled water coils:
1. Constructed of copper tubes and aluminum fins
2. Designed and circuited for chilled water
3. Minimum of six rows

B. Non-trapping circuit design:
1. Working pressure 200 psi.
2. Tappings for drain and air vent.

C. Provide a Peterson Pete's Plug with retainer strap on the inlet and outlet of each coil. Position to

permit accurate pressure readings.

D. Coils shall be constructed in casings as required for installation.

E. Where coils are stacked, provide intermediate drain pans with drop tubes to drain condensate to the main drain pan without flooding the lower coil.

2.3 DIRECT EXPANSION COOLING COILS

A. DX cooling coils:
1. Constructed of copper tubes and aluminum fins.
2. Designed and circuited for use with direct expansion refrigeration.

B. Cooling coil face velocity:
1. Not of magnitude to cause moisture to be carried off the coil.
2. Maximum velocity as scheduled.

C. Circuit cooling coil with interlaced tubes so the entire face is active under all modes of unloading. Refer to the schedule on the drawings.

D. Coils shall be constructed in casings as required for installation.

E. Where coils are stacked, provide intermediate drain pans with drop tubes to drain condensate to the main drain pan without flooding the lower coil.

F. Direct expansion coils must be installed down stream of hydronic coils

2.4 ELECTRIC HEATERS

A. Capacity shall be as scheduled on the drawings. Heater shall have 80% nickel, 20% chromium, open resistance coils insulated by floating ceramic bushings, and be supported in an aluminum steel frame.

B. Ceramic bushings shall be recessed into embossed openings and staked into supporting brackets spaced 3-1/2" maximum center to center.

C. Coil shall be machine-crimped into threaded terminals and insulated with phenolic bushings. All terminal hardware shall be stainless steel.

D. Heater shall be listed by the Underwriters Laboratories for zero clearance to combustible surfaces and for use with central air conditioners.

E. For primary protection, furnish a disk-type automatic reset thermal cutout for pilot duty only.

F. For secondary protection, load-carrying manual reset thermal cutouts shall be wired in series with each heater circuit. Cutouts shall be rated at 480 volts minimum.

G. Voltage, phase and number of heating stages shall be furnished in accordance with duct heater schedule. Three-phase heaters shall have single-phase circuits for operation from a 3-phase, 4-wire power source. Circuits shall be rated at 48 amperes maximum. Furnish one set of line terminals to feed all circuits. Heater shall be tested dielectrically at 2000 volts before shipment. Field-installed conductors feeding the heater shall be sized for 125% of the connected load.

H. Built-in components shall be factory wired to terminal blocks for field connection. All internal wiring shall be insulated for 105°C. Built-in magnetic contactors shall disconnect all ungrounded conductors to each circuit. Furnish heaters with an air flow switch that will not allow heaters to energize without proof of air flow. Built-in transformer shall be dry industrial type, sized to carry full contactor holding coil load. Primary windings shall be fused at the factory. Built-in fuses shall be factory wired to each circuit to protect all underground conductors. Type NON or NOS fuses to be factory installed in phenolic fuse blocks. Built-in disconnect switch to be snap action, industrial type. Provide a door interlock mechanism to prevent hinged terminal box cover from being opened when the switch is on. Switch shall be unfused.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the duct heaters in accordance with the manufacturer's Installation, Start-Up and Service Instructions.

END OF SECTION

SECTION 23 82 18

DUCTLESS MINI SPLIT DX UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install mini split system. Complete with a slim silhouette, compact, high wall fan coil section with wire wall mounted thermostat and a slim silhouette horizontal discharge outdoor condensing unit. Unit shall be provided with inverter driven compressor, pre-charged with R32 or R454b refrigerant. air-cooled condensing units complete with casing, compressor, condenser coil, condenser fan and controls required for a split air conditioning system.

1.2 RELATED WORK

A. Refrigerant Piping.

B. Electrical Provisions of Mechanical Work.

1.3 PERFORMANCE

A. Provide performance as scheduled on drawings, and head pressure control to enable unit to operate in temperatures as low as 20 degrees F. ambient.

1.4 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute’s (AHRI) Standard 210 and bear the AHRI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 Quality assurance Standards and ISO 14001 which are set of standards applying to sustainability and environmental protection set by the International Standard Organization (ISO).

E. A pressure charge of R410A refrigerant sufficient for up to twenty-five (25) feet of refrigerant tubing shall be provided in the outdoor condensing unit.

F. A dry air holding charge shall be provided in the indoor section.

1.5 WARRANTY

A. Unit shall have a manufacturer’s parts and defects warranty for a period five (5) years from the date of the original installation. The compressor shall have a warranty of seven (7) years from date of installation. Warranties shall start at the date of substantial completion.

PART 2 - PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

A. Carrier

B. Trane - Mitsubishi

C. LG

2.1 INDOOR UNIT GENERAL

A. The indoor shall be factory assembled, wired and run tested. Contained within the unit cabinet shall be all factory wiring, internal piping, electronic control circuit board and fan with fan motor.

B. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and auto restart after power interruption function, an emergency operation function and a test run switch.

C. Indoor unit and refrigerant pipes shall be charged with dry air before shipment from the factory. All refrigerant piping must be insulated.

2.2 CABINET

A. The casing shall have a smooth front, top return, in a white finish.

B. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.

C. There shall be a separate installation plate which secures the unit firmly to the wall. Secure mounting of plate and all mounting hardware shall be furnished by and be the responsibility of the installer.

2.3 FAN

A. The indoor unit fan shall be an assembly with a line-flow fan direct driven by a single motor mounted in rubber motor mount.

B. The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

C. Manual adjustable vertical guide vanes shall be provided with the ability to change the airflow from side to side (left to right).

D. An integral, motorized, horizontal air sweep flow louver shall provide an automatic change in airflow by directing the air up and down to provide for uniform air distribution.

E. The indoor unit fan motor shall operate in four (4) selectable speeds, Powerful, High, Medium, and Low.

2.4 FILTER

A. Return air shall be filtered by means of easily removed, washable, Catechin air filter and an anti-allergy enzyme filter – blue bellows type.

2.5 COIL

A. The indoor unit (evaporator) coil shall be of nonferrous construction with smooth, pre-coated aluminum fins on copper tubing.

B. Tubing shall have inner groves for high efficiency heat exchange.

C. All tube joints shall be brazed with PhosCopper or silver alloy.

D. The coil shall be pressure tested at the factory.

E. A sloped condensate pan and drain shall be provided under the coil. Drain connections shall be provided at each end of the drain pan. A condensate mini-pump shall be provided to provide a means of condensate disposal when a gravity drain is not available.

2.6 ELECTRICAL

A. Power for the indoor unit shall be supplied from the outdoor unit.

B. Power supply shall be as indicated on the drawings.

C. The unit shall be equipped with a micro-processor control system directing indoor and outdoor unit coordinated operation.

D. The indoor unit shall not have any supplemental electrical heat elements.

2.7 CONTROL

A. This system shall have a wired wall mounted thermostat/controller to perform input functions necessary to operate the system. The controller shall consist of a Power On / Off switch, Mode Selector, Temperature Setting, Timer Control, Fan Speed Select and Auto Vane Selector.

B. Temperature changes shall be by 1°F increments with a range of 65°F to 87°F.

C. There shall be a 24 hour On / Off timer.

D. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the space controller, providing emergency operation and controlling the outdoor unit.

E. The control voltage between the indoor unit and the outdoor unit shall be 115 volts, AC.

F. The system shall be capable of automatic restart when power is restored after power interruption.

G. The control system shall control the operation of the air sweep louvers, as well as provide on / off and system / mode function switching.

2.8 OUTDOOR UNIT GENERAL

A. The outdoor unit is designed specifically for use with the indoor units. The outdoor unit shall be completely factory assembled, internally piped and wired. Each unit shall be run tested at the factory.

B. When refrigerant lines are exposed on exterior of building provide “LINE-HIDE” line set cover system.
1. Material, Weather resistant, UV stabilized, ASA/PVC/ABS/Poly/PE
2. Assembly Screws, stainless steel.

C. Provide unit with a ICM surge protection device. Coordinate with Electrical Contractor for installation.

2.9 UNIT CABINET

A. The casing shall be fabricated from zinc coated steel, bonderized with an electrostatically applied, thermally bonded, acrylic or polyester powder coating for corrosion protection.

B. Case and mounting feet shall be as follows:
1. The base shall be of Aluminum-Zinc-Magnesium alloy coated steel, with welded mounting feet.

C. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

2.10 FAN

A. The unit shall be furnished with a directive drive propeller type fan, statically and dynamically balanced for smooth and quiet operation.

B. The fan motor shall have inherent protection, be equipped with permanently lubricated bearings. The fan motor shall be mounted and isolated for quiet operation.

C. The fan shall be provided with a raised guard to prevent contact with moving parts.

D. The outdoor unit shall have horizontal discharge airflow.

2.11 COMPRESSOR

A. The compressor shall be a high performance, inverter driven rotary type.

B. Compressor shall be mounted using rubber isolating bushings to avoid the transmission of vibration.

C. Compressor shall be protected by an automatic over current relay and a thermal overload switch.

D. Unit shall include a factory holding charge of R32 or R454B refrigerant and oil.

C. Stop valves shall be installed on the suction inlet and discharge outlet of each compressor or condensing unit and outlet of each liquid receiver for systems containing more than 6.6 lbs of refrigerant. In addition, stop valves are also required on the inlet of each liquid receiver and inlet of each condenser where more than one condenser is used in parallel for systems containing more than 100 lbs of refrigerant.

D. Provide unit with a refrigerant monitoring sensor option that detects refrigerant leaks throughout the refrigeration system to shut down the unit when a leak is detected. In addition, an alarm contact shall be provided within unit controller for connection to the building management system.

2.12 OPERATION

A. The outdoor unit shall have an accumulator.

B. The outdoor unit must have the ability to operate with a maximum height difference of 35 feet between indoor and outdoor units.

C. The unit shall have a maximum refrigerant tubing length of 65 feet between indoor and outdoor units without the need for line size changes, traps or additional oil. All refrigerant lines must be insulated.

D. The unit shall be pre-charged for a maximum of 25 feet of refrigerant tubing.

2.13 ELECTRICAL

A. Power supply shall be as indicated on the drawings.

B. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control voltage between the indoor unit and the outdoor unit shall be 115 volts, AC.

2.14 A2L REFRIGERANT LEAK DISSIPATION SYSTEM

A. Leak dissipation system shall consist of control board and A2L sensor certified to UL 60335-2-40, integrated with unit controller.

B. System shall be designed for the life of the unit.

C. Dissipation system shall be automatic, ship pre-wired, and require no additional field connections to function.

D. Refrigerant leak sensor shall be installed in UL-certified location and orientation. Sensor shall be self-correcting and resettable. Single use refrigerant leak sensor shall not be permitted.

E. Factory-installed dissipation system shall use onboard microprocessor and include:

1. Automatic leak detection and dissipation algorithm.
2. Automatic reset after a dissipation event has occurred.
3. Onboard LED with flash code to indicate current unit status and hardware failures.
4. Depressible “Test” button to allow for a system test and recall/reset of leak detection history.
5. 24-v dry contact alarm terminal on dissipation control board to allow for external notification of leak detection.
6. Ability to notify BAS system of dissipation event via readable alarm point unit controller.
7. Recallable dissipation alarm history on unit controller.

F. Dissipation control board shall be accessible via normal maintenance locations and LED shall be visible.

G. Dissipation system shall “Fail Safe” per UL requirements.

H. Dissipation shall allow smoke and building fire systems to override in case of event.

I. Sequence upon receiving leak detection signal from any indoor unit:
1. Switch to COOL operation regardless of previous operation mode.
2. Close liquid shutoff valve and run pump-down operation.
3. Upon completion of pump-down operation, close suction shutoff valve.
4. Stop compressor operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount condensing units on existing roof equipment supports as shown on Drawings or as recommended by the equipment manufacturer. Install refrigerant filter dryer and sight indicating glass.

B. Install units on vibration isolation pads.

C. Ensure unit provided will meet the refrigerant and line lengths required by the installation as indicated on the drawings.

3.2 CONTROL WIRING

A. Furnish and install control wiring as required. Install control wiring in conduit.

3.3 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer’s recommendations.

B. The wired controller shall be shipped inside the carton with the indoor unit and able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

3.4 CONTRACTOR DECLARATION

A. Installing contractor shall issue a certificate of test to the code official for all systems containing 55 lbs or more of refrigerant. The certificate shall include the test date, name of refrigerant, test medium and the field test pressure applied to the high-pressure side and the low pressure side of the system. The certification of the test shall be signed by the installing contractor and shell be made part of the public record.

3.5 START-UP

A. Follow the manufacturer's start-up procedures.

B. Provide flexible elastomeric rubber closed cell insulation to prevent condensation from occurring op suction piping. After completion of successful start-up, installing contractor shall seal all openings in

insulation and apply a protective aluminum sheetmetal jacket over insulation exposed on exterior of building.

END OF SECTION

SECTION 23 82 19

FAN COIL UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Floor mounted decorative cabinet fan/coil units, horizontal fan/coil units for concealed installation and horizontal exposed ceiling mounted fan/coil units with decorative cabinet.

1.2 RELATED WORK

A. Division 23 Mechanical
   1. Air Balance
   2. Controls
   3. Electrical Provisions of Mechanical Work
   4. Ductwork
   5. Air filtration

1.3 REFERENCES

A. ANSI/AHRI 410 - force circulation air cooling and air heating coils

B. National Electrical Code

1.4 SUBMITTALS

A. Submit manufacturer's dimensioned product data sheets.
   1. Show location of filter access doors.

B. Submit fan performance curve for each unit:
   1. Plot fan volume against static pressure, horsepower and efficiency.
   2. Show point of rating based on static requirements of the system.

C. Submit the fan performance plot at each motor speed position with consideration for the reduced internal static.

D. Submit a chart of specific sound power level at each octave band center frequency.

E. Submit manufacturer's certified heating and cooling coil capacity data.

F. Submit filter manufacturer's product data sheets and capacity information.

G. Submit manufacturer's data on housing insulation material.

1.5 CAPACITY

A. Refer to equipment schedule.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Trane

B. Carrier

C. York

2.2 COMPONENTS

A. Fan section

B. V-belt drive assembly, or,

C. Multi-speed direct connected motor

D. Filter section

E. Coil section

F. Insulated sheet metal cabinet with removable panels for access to the interior

G. Motor and drive inside the cabinet

2.3 FAN SECTION

A. Locate the motor and drive assembly inside the cabinet.

B. Size each v-belt drive for 50% overload.
1. Adjustable pitch motor pulley
2. Provide built-in motor protection
3. Belt adjustment means

C. Provide multi-speed direct connected fan motor with built-in motor protection.
1. Three-speed windings
2. Factory wired to a junction box with provisions for motor speed change, mounted on the box
3. Resiliently mounted

D. Select the fan motor so that the brake horsepower required to deliver the design air quantity at the system static pressure will not exceed the motor nameplate amperage rating.

E. Supply Fans:
1. Double width, double inlet, forward curve blade
2. Statically and dynamically balanced
3. Tested after being installed in the fan section
4. Selected for the design air quantities and static pressure of the system
5. Mounted on a common shaft if multiple wheels

F. Select fan to operate at or near its maximum efficiency point when handling the required air quantity and static pressure.

G. Fan Bearings:
1. Permanently lubricated
2. Self-aligning

2.4 DECORATIVE HOUSING AND PLENUM

A. Where units are exposed to view in occupied spaces and where scheduled, construct cabinets of cold rolled steel, bonderized and coated with baked enamel finish.

B. Access panels shall have position locking fasteners for easy removal.
1. Plated screws with captive nuts
2. Hinged if too large for one man operation

2.5 UNIT HOUSING

A. Construct the unit of galvanized steel sheets, and formed members.
1. Provide structure to brace the assembly for the pressure of the system.

B. Bolt housing components together with neoprene gasketed airtight joints.

C. Internally insulate the entire unit with neoprene coated, 1-1/2 lb. density glass fiber insulation, applied to internal surfaces with adhesive and weld pins. Coat exposed edges of insulation with adhesive.

D. Insulation, vapor barriers, facings and adhesives:
1. Flame spread not higher than 25
2. Smoke developed rating not higher than 50

E. Condensation on the exterior of the unit is not approved.

F. Provide a duct flange on four sides of the return air inlet and supply air outlet of the unit.
1. Sized to permit connection of the flexible connection to the ductwork
2. Extend beyond the primary drain pan
3. Minimum dimension 2"

G. Provide insulated, removable panels for access to the interior.
1. Plated captive screws and nuts
2. Neoprene gaskets

2.6 CONDENSATE DRAIN PANS

A. IAQ style drain pans shall be provided under all coils.
1. Pitch to drain connection
2. Fabricated from 16 gauge 304 stainless steel
3. Triple pitched for complete drainage with no standing water
4. Insulated to prevent condensation
5. Welded corners
6. Stainless drain connection

2.7 COILS

A. Reference Schedule and Specification Section 23 82 16.

2.8 FILTER SECTION

A. Locate behind access doors.
1. Construct with substantial hinges
2. Neoprene gaskets
3. Permanent quick-release latching devices

B. Arranged to accommodate the 2" thick filters as specified.
1. Single section filter

C. Provide full length tracks to support the filter.

D. Refer to section 23 41 00 Filtration specification. Units shall be provided with renewable media filter frames and configured to accept 2” disposable filters as specified. Units shall utilize 2” disposable filters throughout construction and substantial completion.

PART 3 - EXECUTION

3.1 SPARE PARTS

A. Provide the following spare parts and material to the Owner for use after the warranty period.
1. One spare fan motor for each size of fan motor on the project
2. One spare set of filters or filter media for each fan coil unit on the project

3.2 ELECTRICAL REQUIREMENTS

A. Bring electrical connections to a common junction box.

3.3 STORAGE

A. Storage and shipping in accordance with manufacturer's recommendations.

3.4 INSTALLATION

A. Install unit so motor connections and filters are accessible.

END OF SECTION

SECTION 23 82 39

ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide and install electric unit heaters complete with heating element, propeller mounting brackets and other options as specified.

1.2 RELATED WORK

A. Division 23 - Mechanical.
   1. Electrical Provisions of Mechanical Work.
   2. Ductwork.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Modine

B. Reznor

C. Chromalox

D. Trane

E. Markel

2.2 COMPONENTS

A. Casing:
   1. Construct casing of sheetmetal with a structural frame.
   2. Enamel or lacquer finish to manufacturers standard.

B. Electric Heating Elements:
   1. Shall bear the UL label.
   2. Corrosion resistant materials.
   3. Heating coil of 80-20 nickel-chrome wire.

C. Components:
   1. Fused control circuits
   2. Contactors in accordance with the staging requiremens
   3. Control power transformer
   4. Control voltage 120

D. Louvers:
   1. Adjustable vertical and horizontal louvers for air discharge.

E. Mounting brackets:
   1. As indicated

2.3 CONTROLS

A. Automatic controls:
   1. Factory mounted
   2. Prewired to the junction box
   3. Unit mounted thermostats 24-volt low voltage

B. Safety Controls:

1. A primary and secondary thermal cut-off to de-energize each circuit.
2. Manual reset high limit
3. Automatic reset thermal protection

2.4 FAN

A. Propeller blade fan:
1. Construct the fan of aluminum or other corrosion-resistant material.
2. Statically and dynamically balanced
3. Substantial fan guard

2.5 MOTOR

A. Totally enclosed ball bearing motor:
1. Permanently lubricated bearings
2. 120 volt, single phase, 60 cycle motor
3. Sized to operate the fan at the required capacity

2.6 ELECTRICAL

A. Single point connection:
1. Factory wiring
2. Only direct line supply and thermostat field connections
3. Terminal blocks for line voltage wiring
4. Wiring diagram permanently attached
5. Balance phases

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish units with suitable connections for mounting as shown or as otherwise approved.

B. Provide start-up to ensure correct operation of unit.

C. Adjust discharge louvers to control direction of air flow.

END OF SECTION

SECTION 26 01 00

COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for electrical systems, assemblies, and equipment.

B. Related Sections:
1. Division 01 Section 016500 – “GENERAL COMMISSIONING REQUIREMENTS” for general commissioning process requirements.
2. Division 22 Section 220100 – “COMMISSIONING OF PLUMBING SYSTEMS”.
3. Division 23 Section 230100 - “COMMISSIONING OF MECHANICAL SYSTEMS”.

1.3 DEFINITIONS

A. Refer to section 016500 - GENERAL COMMISSIONING REQUIREMENTS.

1.4 CONTRACTOR’S RESPONSIBILITIES

A. Refer to section 016500 - GENERAL COMMISSIONING REQUIREMENTS.

B. Perform commissioning tests at the direction of the CxA.

C. Attend construction phase controls coordination meeting.

D. Participate in electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide Project-specific construction checklists and commissioning process test procedures for actual electrical systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

G. Direct and coordinate commissioning testing among subcontractors, suppliers, and vendors.

H. Provide test data, inspection reports, and certificates for Systems Manual.

1.5 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:
1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's pre-start and startup checklists for electrical systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, pre-start checks, and startup procedures have been completed.
5. Certificate of readiness certifying that electrical systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.

7. Corrective action documents.

1.6 SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, pre-start, and startup activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to section 016500 - GENERAL COMMISSIONING REQUIREMENTS.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. Contractor shall conduct Pre-functional Testing to document compliance with installation and start-up checklists prepared by Commissioning Authority for the Division-26 items.

B. Request verification of Pre-functional checklists by CxA prior to proceeding with system start-up and Functional Testing of systems.

C. Refer to Section 016500 - GENERAL COMMISSIONING REQUIREMENTS for issues relating to pre-functional checklists and testing, including list of systems to be commissioned, description of process, details on non-conformance issues relating to pre-functional checklists and test.

D. Contractor shall participate in Pre-Functional testing activities to document electrical work associated with mechanical and plumbing systems.

3.3 SYSTEM START-UP, TESTS & INSPECTIONS

A. Contractor is solely responsible for system start-up. CxA may, at his discretion, witness start up procedures, but will not perform any Functional Testing of systems until General Contractor has completed start-up and resolved all operating deficiencies.

B. Contractor is solely responsible for all tests and inspections required by the Authority Having Jurisdiction (AHJ). All test reports and certificates required by the AHJ shall be submitted prior to Functional Testing.

C. Contractor shall provide no less than 48 hours' notice prior to conducting tests specified in other sections of the specifications, including:
1. Generator and transfer switch testing
2. Grounding tests

3.4 FUNCTIONAL TESTING PREPARATION

A. Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

D. Inspect and verify the position of each device and interlock identified on checklists.

E. Check all notification and initiation devices and interlocks with associated systems during each mode of operation.

F. Testing Instrumentation: Provide instrumentation and personnel as required to conduct tests.

3.5 FUNCTIONAL TESTING PROCEDURES OF SYSTEMS TO BE COMMISSIONED

A. Lighting Systems:
1. Light Fixtures: Verify all lamps work without flicker.
2. Light Switches: Verify switches control lights per design
3. Lighting Controls:
a. Verify sensors pick up motion and turn on lights immediately.
b. Verify that lights turn off after specified time.
c. Verify sensor coverage includes entire room area being sensed.
d. Verify sensor does not pick up occupancy outside the area sensed.
e. For ceiling mounted occupancy switches, verify light switches still function in circuit.

B. Service Grounding Test:
1. CxA will witness ground tests to be conducted by Contractor in accordance with specifications. Contractor will provide CxA a minimum 48 hours advance notice of test so that CxA may be witness, or he shall re-test in CxA's presence. Ground resistance testing is to include lightning protection system as well as electrical power systems.
2. Provide ground test report for review by CxA.

3.6 TRAINING

A. Refer to sections 016500 - GENERAL COMMISSIONING REQUIREMENTS.

3.7 O&M MANUALS

A. Refer to sections 016500 - GENERAL COMMISSIONING REQUIREMENTS

END OF SECTION

SECTION 26 01 05

ELECTRICAL OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Compile electrical product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare electrical operating and maintenance data as specified in this Section and as referenced in other sections of specifications.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit 3 copies of complete manual in final form.

1.2 ELECTRICAL OPERATING AND MAINTENANCE MANUAL SUBMITTAL SCHEDULE

A. Thirty (30) days after receipt of reviewed submittals bearing the Architect / Engineer's stamp of acceptance (including re-submittals), submit for review 1 copy of the first draft of the Electrical Operating and Maintenance Manual. This copy shall contain as a minimum:
   1. Table of Contents for each element
   2. Contractor information
   3. All shop drawings, coordination drawings and product data, bearing the Architect / Engineer's stamp of acceptance.
   4. All parts and maintenance manuals for items of equipment
   5. Warranties (without starting dates)
   6. Certifications that have been completed; submit forms and outlines of certifications that have not been completed
   7. Operating and maintenance procedures.
   8. Form of Owner's Training Program Syllabus (including times and dates)
   9. Control operations / equipment wiring diagrams
   10. Coordination Drawings
   11. Schedule of Lamps, Light Engines
   12. Schedule of Ballasts and Drivers
   13. Schedule of Fuses
   14. Other required operating and maintenance information that are complete.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit the completed manuals in final electronic form to the Architect / Engineer.
   1. Prior to substantial completion for Owner's use after the Owner accepts facility maintenance.
   2. Include all specified data, test reports, drawings, dated warranties, certificates, along with other materials and information.

D. The Architect / Engineer shall review the manuals for completeness within 15 days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Architect / Engineer. The manuals will not be retransmitted.

F. Complete electronic manuals shall be delivered to the Owner prior to substantial completion.

PART 2 - PRODUCTS

2.1 BINDERS

A. Commercial quality black, 3-ring binders with clear, durable, cleanable plastic covers.

B. Minimum ring size: 1"; Maximum ring size: 3".

C. When multiple binders are used, correlate the data into related groupings.

D. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 ELECTRICAL OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals:
1. Prepare data in form of an instructional manual for use by Owner's personnel.
2. Format:
a. Size: 8-1/2" x 11"
b. Text: Manufacturer's printed data or neatly typewritten.
3. Drawings:
a. Provide reinforced punched binder tab and bind in text.
b. Fold larger drawings to size of text pages.
4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
a. Title of Project
b. Identity of separate structures as applicable
c. Identity of general subject matter covered in the manual.
6. Binder as specified

B. Content of Manual:
1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
a. Contractor, name of responsible principal, address and telephone number
b. A list of each product required to be included, indexed to content of the volume.
c. List with each product, name, address and telephone number of:
1) Subcontractor or installer
2) Maintenance contractor as appropriate
3) Identify area of responsibility of each.
4) Local source of supply for parts and replacement
d. Identify each product-by-product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
a. Include those sheets pertinent to the specific product.
b. Annotate each sheet to:
1) Identify specific product or part installed.
2) Identify data applicable to installation.
3) Delete references to inapplicable information.
3. Drawings:
a. Supplement product data with drawings as necessary to illustrate:
1) Relations of component parts of equipment and systems
2) Control and flow diagrams
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
c. Do not use Project Record Documents as maintenance drawings.
4. Written text as required to supplement product data for the particular installation:
a. Organize in consistent format under separate headings for different procedures.
b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued
a. Provide information sheet for Owner's personnel, giving:
1) Proper procedures in event of failure
2) Instances that might affect validity of warranties or bonds
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems
1. Content for each unit of equipment and system as appropriate:

a. Description of unit and component parts:
   1) Function, normal operating characteristics, and limiting conditions.
   2) Performance curves, engineering data and tests.
   3) Complete nomenclature and commercial number of replaceable parts.
b. Operating procedures:
   1) Start up, break-in, routine / normal operating instructions
   2) Regulation, control, stopping, shut down and emergency instructions
   3) Summer and winter operating instructions
   4) Special operating instructions
c. Maintenance procedures:
   1) Routine operations
   2) Guide to trouble-shooting
   3) Disassembly, repair and reassembly
   4) Alignment, adjusting and checking
   5) Routine service based on operating hours
d. Servicing and lubrication schedule
   1) List of lubricants required
e. Manufacturer's printed operating and maintenance instructions.
f. Copies of typed circuit directories of panel board to reflect actual room graphics numbers and room names (not architectural room numbers from the drawings).
   1) Electrical
   2) Controls
   3) Communications
g. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
   1) Predicted life of part subject to wear
   2) Items recommended to be stocked as spare parts
h. Schedule of fuses
i. Complete equipment field accessible internal wiring diagrams
j. Schedule of lamps
k. Schedule of ballasts
l. Each Contractor's coordination drawings
m. List of original manufacturer's spare parts and recommended quantities to be maintained in storage
n. Other data as required under pertinent sections of the specifications

2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications
4. Provide complete information for products specified in Division 26.
5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.
8. Provide training report and certificates.

END OF SECTION

SECTION 26 05 00

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, and Supplementary Conditions, applicable provisions of Division 1 General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 26 Electrical.

B. Applicable provisions of this section apply to all sections of Division 26, Electrical.

1.2 CODE REQUIREMENTS AND FEES

A. Perform work in accordance with applicable statutes, ordinances, codes and regulations of governmental authorities having jurisdiction.

B. Electrical work shall comply with applicable inspection services:
1. Underwriters Laboratories
2. National Fire Protection Association
3. State Health Department
4. Local Municipal Building Inspection Department adopted codes with amendments
5. National Electrical Code with local amendments
6. State Regulatory Agencies
7. Where the project is located outside a municipal jurisdiction, and has no municipal inspection services, the National Electrical Code with amendments of the municipality with extraterritorial jurisdiction shall govern.
8. Where the project is located outside any municipal jurisdiction, including extraterritorial jurisdictions, the National Electrical Code with local adopted amendments of the largest municipality located in the same county or parish shall govern.
9. International Energy Conservation Code
10. National Electrical Safety Code

C. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

D. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

E. Obtain all permits required.

1.3 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A specialist in this field and have the personnel, experience, training, and skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than 3 systems of comparable size and type that has served their Owners satisfactorily for not less than 3 years.

1.4 REFERENCE SPECIFICATIONS AND STANDARDS

A. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, APWA, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date proposals are received. Referenced specifications and standards are minimum requirements for all equipment, material and work. In instances where specified capacities, size or other features of equipment, devices or materials exceed these minimums, meet specified capacities.

B. Use electrical materials and equipment that is constructed and tested in accordance with the standards of NEMA, ANSI, ASTM, or another recognized commercial standard. If materials and equipment is labeled, listed, or recognized by any Nationally Recognized Testing Laboratory (NRTL) acceptable to the Occupational Safety and Health Administration (OSHA), then provide NRTL-labeled, listed, or recognized material and equipment. Acceptable NRTLs include but are not limited to:
1. Underwriters Laboratories, Inc. (UL)
2. Factory Mutual Research Corp. (FMRC) (also referred to as “Factory Mutual Global,” or “FM Global”)
3. Intertek Testing Services NA, Inc. (ITSNA, formerly ETL)
4. Canadian Standards Association (CSA)
5. A complete listing of acceptable NRTLs is published on the OSHA website at http://www.osha.gov/dts/otpca/nrtl/.

C. Where material and equipment are not labeled, listed, or recognized by any NRTL, provide a manufacturer’s Certificate of Compliance indicating complete compliance of each item with applicable standards of NEMA, ANSI, ASTM, or other recognized commercial standard.

D. Do not install or use electrical material or equipment for any use other than that for which it was designed, labeled, listed, or identified unless formally approved for such use by the Owner’s AHJ. This *National Electrical Code*® requirement is re-stated for emphasis.

E. Codes and Standards applicable to this Division:
1. ANSI – American National Standards Institute
   a. ANSI Z535.1, Safety Colors
   b. ANSI Z535.2, Environmental and Facility Safety Signs
   c. ANSI Z535.3, Criteria for Safety Symbols
   d. ANSI Z535.4, Product Safety Signs and Labels
2. ASHRAE – American Society of Heating, Refrigeration, and Air Conditioning Engineers:
   a. ASHRAE Standard 90.1, *Energy Standards for Buildings Except for Low Rise Residential Buildings [ANSI, IESNA]*
3. ASTM – American Society for Testing and Materials
4. CBM – Certified Ballast Manufacturers
5. ICC – International Code Council
   a. International Building Code® (IBC)
   b. International Existing Building Code® (IEBC)
6. ICEA – Insulated Cable Engineers Association
   a. ICEA S-93-639, *Shielded Power Cables 5-46kV* (NEMA WC-74)
7. IEEE® - Institute of Electronics and Electrical Engineers
   a. IEEE C2™, *National Electrical Safety Code* (NESC) [ANSI]
   b. IEEE Std 141™, *Recommended Practice for Electric Power Distribution for Industrial Plans* (“Red Book”)
   c. IEEE Std 143™, *Recommended Practice for Grounding of Industrial and Commercial Power Systems* (“Green Book”)
   d. IEEE Std 241™, *Recommended Practice for Electric Power Systems in Commercial Buildings* (“Gray Book”)
   e. IEEE Std 242™, *Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems* (“Buff Book”)
   f. IEEE Std 315™, *Graphic Symbols for Electrical and Electronics Diagrams*
   g. IEEE Std 399™, *Recommended Practice for Power Systems Analysis* (“Brown Book”)

h. IEEE Std 446™, *Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications* (“Orange Book”)
i. IEE Std 493™, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems* (“Gold Book”)
j. IEEE Std 519™, *Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems*
k. IEEE Std 739™, *Recommended Practice for Energy Management in Industrial and Commercial Facilities* (“Bronze Book”)
l. IEEE Std 902™, *Guide for Maintenance, Operation, and Safety of Industrial and Commercial Power Systems* (“Yellow Book”)
m. IEEE Std 1015™, *Recommended Practice Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems* (“Blue Book”)
n. IEEE Std 11oo™, *Recommended Practice for Powering and Grounding Electronic Equipment* (“Emerald Book”)
o. IEEE Std 1584™, *Guide for Performing Arc-Flash Hazard Calculations*

8. IESNA – Illuminating Engineering Society of North America
   a. IESNA *Lighting Handbook*, Ninth Edition
   b. IESNA RP-1, *American National Standard Practice for Office Lighting*
   c. IESNA RP-7, *American National Standard Practice for Lighting Industrial Facilities*
9. NECA – National Electrical Contractors Association:
   a. NECA 1, *Good Workmanship in Electrical Construction* [ANSI]
   b. NECA 90, *Recommended Practice for Commissioning Building Electrical Systems* [ANSI]
   c. NECA 100, *Symbols for Electrical Construction Drawings* [ANSI]
   d. NECA 101, *Standard for Installing Steel Conduits (Rigid, IMC, EMT)* [ANSI]
   e. NECA 104, *Recommended Practice for Installing Aluminum Building Wire and Cable* [ANSI]
   f. NECA / NEMA 105, *Recommended Practice for Installing Metal Cable Tray Systems* [ANSI]
   g. NECA 111, *Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC)* [ANSI]
   h. NECA / NACNA 120, *Standard for Installing Armored Cable (Type AC) and Metal-Clad Cable (Type MC)* [ANSI]
   i. NECA 202, *Recommended Practice for Installing and Maintaining Industrial Heat Tracing Systems* [ANSI]
   j. NECA 230, *Standard for Selecting, Installing and Maintaining Electric Motors and Motor Controllers* [ANSI]
   k. NECA 331, *Standard for Building and Service Entrance Grounding and Bonding*
   l. NECA 400, *Standard for Installing and Maintaining Switchboards* [ANSI]
   m. NECA 402, *Standard for Installing and Maintaining Motor Control Centers* [ANSI]
   n. NECA / EGSA 404, *Standard for Installing Generator Sets* [ANSI]
   o. NECA 407, *Recommended Practice for Installing and Maintaining Panelboards* [ANSI]
   p. NECA 408, *Recommended Practice for Installing and Maintaining Busways* [ANSI]
   q. NECA 409, *Recommended Practice for Installing and Maintaining Dry-Type Transformers* [ANSI]
   r. NECA 410, *Recommended Practice for Installing and Maintaining Liquid-Filled Transformers* [ANSI]
   s. NECA 411, *Recommended Practice for Installing and Maintaining Uninterruptible Power Supplied (UPS)* (ANSI]
   t. NECA 420, *Standard for Fuse Applications* [ANSI]
   u. NECA 430, *Standard for Installing Medium-Voltage Metal-Clad Switchgear* [ANSI]
   v. NECA / IESNA 500, *Recommended Practice for Installing Indoor Lighting Systems* [ANSI]
   w. NECA / IESNA 501, *Recommended Practice for Installing Exterior Lighting Systems* [ANSI]
   x. NECA / IESNA 502, *Recommended Practice for Installing Industrial Lighting Systems* [ANSI]

y. NECA / MACSCB 600, *Recommended Practice for Installing and Maintaining Medium-Voltage Cable* [ANSI]
z. NECA / NEMA 605, *Installing Underground Nonmetallic Utility Duct* [ANSI]

10. NEMA – National Electrical Manufacturers Association
11. NETA – International Electrical Testing Association, Inc.:
    a. NETA ATS, *Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems*
    b. NETA MTS, *Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems*
    c. NETA ETT, *Standard for Certification of Electrical Testing Technicians* [ANSI]
12. NFPA – National Fire Protection Association:
    a. NFPA 20®, *Standard for the Installation of Stationary Pumps for Fire Protection®*
    b. NFPA 70 ™, *National Electrical Code® (NEC®)*
    c. NFPA 70E, *Standard for Electrical Safety in the Workplace.*
    d. NFPA 101®, Life Safety Code®
    e. NFPA 110, *Standard for Emergency and Standby Power Systems*
    f. NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*
    g. NFPA 780, *Standard for the Installation of Lightning Protection Systems*
    h. All other NFPA codes and standards except NFPA 5000
13. OSHA – Occupational Safety and Health Administration
14. IECC – International Energy Conservation Code
15. ISO – International Organization for Standardization
16. State and Local Energy Conservation Code
17. Applicable County and Municipal Codes

1.5 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

B. Every effort has been made by the Engineer to indicate wiring of all receptacles, light fixtures, switches, telephone outlets, HVAC equipment, other equipment, elevator equipment, and all other devices / appliances requiring electrical power. It is the intent of the Engineer that all light fixtures be powered and controlled unless specifically noted on the plans; that all wiring devices (receptacles and direct connected equipment) be circuited to a power source of the correct voltage and that all HVAC, elevator equipment and other equipment be properly wired to the correct voltage power source; that all communications and security systems devices and equipment and all fire alarm system devices and equipment are installed, wired and systems are fully operational.

C. It is the responsibility of the Contractor to review the construction drawings (reflected ceiling plans) for light fixtures, casework elevation details for electrical devices which are not indicated on the electrical drawings; to review the mechanical and plumbing documents and all other drawings to determine the electrical rough-ins for all equipment requiring power connections, and to include in their proposals the correct and complete electrical rough-ins for all of these items which were inadvertently not indicated on the electrical drawings, OR the Contractor shall specifically enumerate each item requiring electrical rough-in which is not specifically shown on the electrical drawings, and indicate the electrical provisions of these items as specifically excluded from his proposal.

D. It is the responsibility of the Contractor to compare the scale of all electrical drawings with the scale of the architectural drawings and make adjustments to all electrical drawings which have the incorrect drawing scale so that his material takeoffs are not in error due to an incorrectly labeled drawing scale and his proposal is complete.

E. No proposal shall be accepted which specifically excludes any of the provisions of paragraphs B, C, or D above.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various major and minor feeders, equipment, and other pertinent items, as installed. Record underground and under slab service and feeders installed, dimensioning exact location and elevation of such installations.

B. At conclusion of project, obtain without cost to the Owner, electronic PDF and AutoCAD 2014 and / or Revit CAD files of the original drawings and transfer as-built changes to these. Provide the following as-built documents including all contract drawings regardless of whether corrections were necessary and include in the transmittal: “2 sets of CDs and prints for Owner’s use, one set of CDs, prints, and mylars for Architect / Engineers Records”. Delivery of these as-built electronic, reproducibles and prints is a condition of final acceptance.
1. 3 sets of electronic AutoCAD (2014 dwg) and / or Revit CAD drawing files, on CD-ROM media, of each contract as-built drawing.
2. One reproducible Dayrex Mylar film positive of each contract as-built drawing.
3. Three sets of blue-line prints of each contract as-built drawing.
4. Three sets of pdf prints of each contract as-built drawing on CD.

C. As-Built Drawings should indicate the following information as a minimum:
1. Indicate all addendum changes to documents.
2. Remove Engineer’s Seal, name, address, and logo from drawings.
3. Mark documents RECORD DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY:
5. Indicate all changes to construction during construction. Indicate actual routing of all conduits, etc. that was deviated from construction drawings.
6. Indicate exact location of all underground electrical raceways, and elevations.
7. Correct schedules to reflect (actual) equipment furnished and manufacturer.
8. During the execution of work, maintain a complete set of Drawings and specifications upon which all locations of equipment, devices, and all deviations and changes from the construction documents in the work shall be recorded.
9. Exact location of all electrical equipment in building. Label panel schedules to indicate actual location.
10. Exact location of all electrical equipment in and outside of the building.
11. Exact location of all outdoor lighting poles and equipment.
12. Location, size and routing of all feeder conduits, equipment, etc. shall be accurately and neatly shown to dimension.
13. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
14. Cloud all changes.
15. Update all panel schedules with all additional circuits added or deleted through construction. Identify each circuit to include all information specified for directory cards for circuit identification in panelboards.

1.7 SPACE REQUIREMENTS

A. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.8 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements. Extend electrical services and final connections to all items requiring same.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Provide sleeves and inserts in forms as required for the work. Stub up and protect open ends of pipe before any concrete is placed. Furnish sizes of required equipment pads. Furnish and locate bolts and fittings required to be cast in them.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under other Division. Determine from the General Contractor / Construction Manager for the various trades, the Owner, and by direction from the Architect / Engineer, the exact location of all items. The construction trades involved shall furnish all roughing-in drawings and wiring diagrams required for proper installation of the electrical work.
   1. Make final electrical connections to all electrically operated equipment indicated on the drawings, except as noted.
   2. The responsibility for alignment of motor and driven equipment is specified in the related division.

F. Request all Shop Drawings required in ample time to permit proper installation of all electrical provisions.

G. Extend services as indicated to the various items of equipment furnished by others. Rough-in for the various items and make final connections ready for operation upon placing of the equipment.

1.9 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is defined as hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is defined as open to view, in plain sight.

1.10 GUARANTEE

A. Guarantee work for 1 year from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. Replacement of failed parts or equipment shall be provided.

1.11 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.12 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, and judged objectionable by the Owner, Architect, or Engineer, rectify such conditions at no additional cost to the Owner. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.13 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 26 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, materials, energy efficiency characteristics (where applicable) and lighting performance characteristics (where applicable) equal to that specified, manufactured by a named manufacturer shall be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before proposal due date. Submit a marked-up set of the relevant specification section indicating all variances, a comparison to the specified product, and of construction and performance criteria, complete design and performance data for the specified product and the proposed substitution for comparison to the Engineer. The Architect issues approvals of acceptable manufacturers as addenda to the Construction Proposal Documents.

1.14 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work:
   1. Obtained from utility maps and other substantially reliable sources.
   2. Are offered separate from the Contract Documents as a general guide only without guarantees to accuracy.

B. Examine the site and verify the location and elevation of all utilities and of their relation to the work. Existing utilities indicated on the site plans are for reference only and shall be field verified by the Contractor with the respective public or private utility.

1.15 OPERATING TESTS

A. After all electrical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect / Engineer and Owner. Provide minimum 24-hour advance notice of scheduling of all tests. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.16 WARRANTIES

A. All normal and extended warranties shall include parts, labor, miscellaneous materials, travel time, incidental expenses, normal freight / shipping, refrigerant, oils, lubricants, belts, filters and any expenses related to service calls required to diagnose and correct warranty problems.

B. Manufacturer’s warranty shall be from one year from date of substantial completion. Contractor shall be responsible for extending the warranties regardless of date of installation or commissioning.

C. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.17 BUILDING CONSTRUCTION

A. It shall be the responsibility of the sub-contractor to consult the Contract Drawings, details and specifications and thoroughly familiarize himself as to the construction and all job-related requirements. All construction trades shall cooperate with the General Contractor / Construction Manager Job site superintendent and lay out work so that all raceways and other items are placed in the walls, furred spaces, chases, etc., so that there shall be no delay in the job.

1.18 TEMPORARY FACILITIES

A. General: Refer to Division 1 for general requirements on temporary facilities.

B. Temporary Wiring: Temporary power and lighting for construction purposes shall be provided under this Division. Installation of temporary power shall be in accordance with NEC Article 527.

C. Temporary facilities, wire, lights and devices are the property of this Contractor and shall be removed by this Contractor at the completion of the Contract.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 IDENTIFICATION OF EQUIPMENT

A. Identification of Equipment:
   1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Take care not to obliterate this nameplate. The legend on all nameplates or tags shall correspond to the identification shown on the Operating Instructions. All panels, cabinets,

or equipment requiring 120 volt or higher power shall be labeled as required which includes circuit designation and circuit panelboard location, regardless of which discipline installs the equipment.

2. Three layer laminated plastic engraved identifying nameplate shall be permanently secured to each switchboard, distribution panel, motor control center, transformer, panelboard, safety disconnect switch, enclosed circuit breaker, transfer switches, remote generator transfer deices not installed inside light fixtures, wireway, busduct plug, terminal cabinet, surge protective device, capacitor, individual motor controller, contactor, fire alarm panels (main and remote booster), and communications (voice, data, video) cabinet or rack, security panels, time clocks, BMCS cabinets, sound reinforcement cabinets and racks, miscellaneous control cabinets, equipment integral disconnect switches, toggle or motor switches, disconnects for equipment, exterior junction boxes, exterior pull boxes, exterior wireways and gutters, and rooftop equipment (i.e.: supply and exhaust fans, rooftop HVAC equipment) with stainless steel screws.
   a. Utility Power: White letters on black background
      Generator Power (White letters on red background
      UPS Power: White letters on blue background
      Load Bank Circuits: White letters on green background
      Solar or Wind Power Generation: White on orange background
   b. Identifying nameplates shall have 1/2-inch high, engraved letters for equipment designation and ¼-inch letters indicating source circuit designation, (i.e.: “PANEL HA –fed from MDP-6 located in Mech. Rm. 100”). The words “fed from” and “located” shall be included in the labeling.
      Example: Panel HA
      Fed From MSB
      Located Main Elec. RM 100
      Example: Disconnect for Panel LK
      Location: Kitchen
      Fed From Transformer TLK
      Located Main Elec. RM 100
   c. Each switchboard, distribution panel, transfer switch, generator transfer device (GTD) for emergency lighting, and motor control center feeder or branch circuit device shall have a nameplate showing the load and location of load served in ¼-inch high, engraved letters. Circuit breaker name and kirk key designation if applicable
   d. Each section of multiple section panelboards shall also indicate panelboard section number (i.e.: Panel “HA-Section 2 – fed from MDP-6 located in Mech. Rm. 100”)
   e. Motor Controllers, starters, and contactors: Provide neatly typed label inside each motor controller and contactor enclosure door identifying motor or load served, nameplate horsepower, full load amperes, code letter, service factor, and voltage / phase rating.
   f. Individual motor controller and contactor nameplates shall include load served, location of load served, panel and circuit numbers serving load, location of panel serving load, panel and circuit number serving control circuit, location of panel serving control circuit (if different from panel serving load), description and location (if applicable) of control controlling contactor (i.e. Controlled: Switch in RM 100, and Controlled: BMCS). Contactor nameplate is to include whether it is a lighting or receptacle contactor and name of contactor. i.e., C-1.

Lighting Contactor Example	Receptacle Contactor Example
Lighting Contactor C1 West Parking Lot Pole Lights Fed From Panel HA-2,4,6 Located Main Elec. Rm. 100 Control Circuit-Panel LA 42 Located Main Elec. Rm. 100 Controlled-BMCS	Receptacle Contactor C2 Table Recpts Lab Rm 100 Fed From Panel LA-2,4,6,8 Located Mech. Rm. 110 Control Circuit-Panel LA-42 Controlled-Emer Shut Off Mushroom Switch Rm 101
GTD Example	
Exterior lighting wall packs / north soffit / west metal canopy Fed from Panels EHA-2 located in	

Elec. RM 105 and HA-1 via Lighting Contactor controlled by BMCS located in Elec. RM 200.	

g. Exterior J-boxes, pull boxes, and gutters shall have panel identification, circuit numbers, and location of panel listed on name plate. Low voltage shall be identified per contents, examples: DATA, BMCS, F/A

h. Name plates on equipment served from switchboards, distribution panels, I-Line panels, and motor control centers are not to include circuit numbers shown on drawings as the circuit numbers are for construction drawing purposes only.

i. Panel names for 277/480v shall start with the letter “H” and 120/208v, 120/240v shall start with the letter “L”. No panel shall be named to include a number other than multi sectional panels, example HA-section 2. New panels installed in renovation or site additions shall have names approved or designated by Owner’s electrical representative. Panel names shall not include the letter “I”. Transformer names shall start with the letter “T” followed by the panel name it serves, i.e., TLA.

j. Main service ATS label shall include equipment name, emergency source and location, normal power source and location, panel served and location. Wall mounted ATS serving lighting loads shall include type of lighting and location, emergency panel and circuit ID and location of panel, normal panel and circuit ID and location of panel.

Main Service ATS Example ATS-1	Wall Mounted Lighting ATS Example ATS
Emer Power-Emer Generator	Exterior Wall Packs/Soffit Lights
Located Chiller Yard	North/West Metal Canopy Lights
Normal Power-MSB	Fed from EHA-2
Located-Mech Rm 100	Located Mech Rm 200
Serves Panel EHA	Fed From HB-4
Located-Mech Rm 100	Located Mech Rm 150

k. Name plates shall include rated bus amperage, voltage, number of phases, number of wires and type of essential electrical system as applicable.

l. Switchgear, switchboards, panelboards, motor control centers, or service equipment available fault current labeling: Provide a 2x3 inch permanently affixed (notice) label with white lettering on contrasting blue background permanently affixed to the equipment prior to energizing the equipment. The label shall include the date of installation and the date of calculation and comply with ANSI Z535.4 current standards design and durability. The date of calculation shall be the date indicated by the Engineer of Record’s seal on the Construction Documents. Example:

AVAILABLE FAULT CURRENT: ##, ### AMPS
DATE OF INSTALLATION: MM/DD/YY
DATE OF CALCULATION: MM/DD/YY

3. Cardholders and directory cards shall be furnished for circuit identification in panelboards. Cardholder shall be located on inside of panel door and shall be in a metal frame with clear plastic front. Circuit lists shall be typewritten. Circuit descriptions shall include explicit description and identification of items controlled by each individual breaker, including final graphics room number or name designation and name of each item served. If no building appointed room number or name is given, list locations per the following examples – A. Storage in Rm 100 – B. Office in Rm 100 – C. Storage west of Rm. 100. List corridors as “corridors”. Identify circuits controlled by contactors using a separate notation for each contactor used. List notation at bottom of schedule stating the circuits are controlled by a contactor, list exact location of contactor, and how switched. Do not use architectural room number designation shown on plans. Obtain final graphics room number identification from Architect’s final room number graphics plan. All locations served by breakers shall be listed on schedule. Panel schedule shall be large enough to contain all information required. Also refer to Section 26 24 16.

4. Permanent, waterproof, black markers shall be used to identify each lighting and power grid junction box, gutter and wireway. Clearly indicate the panel and branch circuit numbers available at that junction box, gutter or wireway. Where low voltage relay panels

are used for lighting control, identify the low voltage relay panel and number in addition to the branch circuit panel and number.

5. Pull Boxes, Transformers, Disconnect Switches, etc.: Field work each with a name plate showing identity, voltage and phase and identifying equipment connected to it. The transformer rating shall be shown on the panels or enclosures. For an enclosure containing a motor starter, the nameplate shall include the Owner's motor number, motor voltage, number of motor phases, motor load being serviced, motor horsepower, and motor full load current. Nameplates shall also indicate where panel is fed from.

B. Prohibited Markings: Markings intended to identify the manufacturer, vendor, or other source from whom the material has been obtained are prohibited for installation in public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters Laboratories), and approval labels are exceptions to this requirement.

C. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of electrical facilities. Provide text of sufficient size to convey adequate information at each location, mount permanently in an appropriate and effective location. Comply with industry standards for color and design.

D. Wire and Cable Markers: Provide vinyl cloth markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.

E. Wire and Cable Labeling: Provide wire markers on each conductor in all boxes, pull boxes, gutters, wireways, contactors, and motor controllers and load connection. Identify with panelboard / switchboard branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

F. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch wide plastic tape, colored red for 50 volts or above electrical, or orange for communications and control with suitable warning legend describing buried electrical lines; telephone lines and data lines per APWA recommendations. All underground electrical conduits shall be so identified. Tape shall be buried at a depth of 6-inches below grade and directly above conduits or ductbanks. Provide magnetic marking tape below all underground electrical conduits.

G. Lighting Controls and Equipment: Provide self-adhesive machine typed tape labels with ¼" high white letters on ½" tall black background for digital lighting modules as "DLM". Modules or relays located above ceiling: adhere label to bottom of ceiling T-grid below relay location. Modules or relays located in mechanical or electrical rooms or other areas other than above ceiling: Adhere label to the cover of the module or relay and identify the area they control as "MAIN GYM", "BAND HALL", or "CORRIDOR 100", etc. Remote lighting control switches or push-button stations located remotely from the area they control: Adhere label to device face plate, not obstructing screw fasteners, and intuitively identify function such as "GYM LTG LOW-HIGH" or "CAFE LTG DIM", etc.

3.2 CUTTING AND PATCHING

A. General: Comply with the requirements of Division 1 for the cutting and patching of other work to accommodate the installation of electrical work. Except as authorized by the Architect / Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.

3.3 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to substantial completion, conduct an on-site training program to instruct Owner's operating personnel in the operation and maintenance of the electrical systems.
   1. Provide the training during regular working day.
   2. The instructors shall be experienced in their phase of operation and maintenance of the electrical systems and with the project.
   3. Refer to other specification sections for additional training and commissioning requirements.

B. Time to be allocated for instructions.
   1. Minimum of 20 hours dedicated instructor time.
   2. 4 hours on each of 5 days
   3. Additional instruction time for specific systems as specified in other Sections.

C. Before on-site training, submit the program syllabus; proposed time and dates; for review and approval, minimum 48 hours prior to proposed training time and date.
   1. One copy to the Owner
   2. One copy to the Architect / Engineer

D. The Owner shall provide a list of personnel to receive instructions and shall coordinate their attendance at the agreed upon times.

E. Use operation and maintenance manuals as the basis of instruction. Review manual with personnel in detail. Explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of training. List time and date of each demonstration, hours devoted to the demonstration, and a list of people present, with their respective signatures.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he / she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.4 OPENINGS

A. Framed, cast or masonry openings for boxes, equipment or conduits are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.5 HOUSEKEEPING PADS

A. Provide concrete equipment housekeeping pads under all floor and outdoor mounted electrical equipment.

B. Concrete and reinforcing steel shall be as specified in Division 3, or as indicated or noted.

C. Concrete pads:
   1. 6-inches thick minimum indoors; 8-inches thick minimum outdoors or match existing if indicated on the drawings to extend existing pads, or in other sections of the specifications.
   2. Chamfer strips at edges and corner of forms.
   3. Smooth steel trowel finish.
   4. Extend 3-inches minimum indoors beyond perimeter of equipment unless otherwise shown.
   5. 6-inch x 6-inch #8 wire reinforcement mesh.

3.6 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions, which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
   1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
   2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.7 VANDAL RESISTANT DEVICES

A. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used, and 25 percent spare fasteners.

B. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.8 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

B. Do not deliver equipment to this project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather shall be rejected, and the contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

3.9 COORDINATION OF BRANCH CIRCUIT OVERCURRENT AND PROTECTION DEVICES

A. Review with equipment specified which requires electrical connections. Review equipment shop drawings and manufacturer's nameplate data and coordinate exact branch circuit overcurrent protective device and conductors with equipment provided.
   1. Provide equipment manufacturer's recommended overcurrent protective device indicated on nameplate at no additional cost to the Owner.
   2. If branch circuit conductors and / or conduit sizing is less than the minimum required by equipment manufacturer, notify the Architect / Engineer immediately, prior to rough-in.
   3. If equipment manufacturer is a substitution to the specified equipment manufacturer, provide the greater of the conductors specified or those required for the installed equipment manufacturer’s minimum circuit conductors, at no additional cost to the Owner.
   4. If conductors indicated on plans are in excess of that permitted by equipment manufacturer, notify Architect / Engineer immediately, prior to rough-in.
   5. If conductors indicated on plans are in excess of that permitted by the equipment manufacturer, provide the maximum conductors permitted by the equipment manufacturer based on NEC ampacity tables, either in a single set, or as a set of parallel conductors as permitted by the NEC. Conductor size and quantity entering the equipment enclosures shall not exceed the equipment manufacturer’s maximum recommendations.

3.10 FAULT CURRENT AND ARC FLASH STUDY FOR OVERCURRENT DEVICE COORDINATION

A. Contractor shall provide a coordination study, fault current analysis, and Arc-Flash study report for new electrical distribution equipment downstream to the last new overcurrent device in each feeder or branch circuit, conducted and prepared by the switchgear manufacturer. The coordination study and fault current analysis shall include the manufacturer’s recommendations for all adjustable overcurrent devices specified or provided. Study does not require inclusion of existing switchgear, except it shall include existing or new overcurrent devices in existing switchgear serving new

switchgear. Contractor shall submit the report results prior to submitting switchgear submittals to allow changes or modifications to equipment selection.

B. Contractor shall adjust all overcurrent device settings based on manufacturer's recommendations, or as directed by Owner / Architect at no additional cost to Owner. Settings for GFI shall be set at maximum as permitted by the NEC.

C. Arc-Flash & Shock-Hazard Warning Labels: Provide arc-flash and shock hazard-warning labels that comply with ANSI Z535.4 on switchgear, switchboards, transformers, motor control centers, panelboards, motor controllers, safety switches, industrial control panels and other equipment that is likely to require examination, adjustment, servicing, or maintenance while energized. Locate the marking to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment. On renovation projects, install arc-flash warning labels on existing equipment where lock-out / tag-out will be required for the renovation work. Provide the information listed below on each label. Specify that arc-flash warning label information be produced by the electrical equipment manufacturer or supplier as a part of the final power system studies to be submitted by the Contractor in accordance with the electrical acceptance testing.
   1. Note: In addition to the final arc-flash analysis, the final power system studies include load flow and fault-current calculations, and an overcurrent protective device (OCPD) coordination study based on the actual equipment to be installed for the project.

D. Information to be determined and applied to electrical equipment:
   1. Arc-Flash Protection Boundary
   2. Arc-Flash incident energy calculated in accordance with IEEE Std 15841 ™
   3. Working distance calculated in accordance with IEEE Std 1584a ™
   4. NFPA 70E Hazard / Risk Category Number or the appropriate personal protective equipment (PPE) for operations with doors closed and covers on.
      a. Typical operations include operating circuit breakers, fused switches, and meter selector switches.
   5. System phase-to-phase voltage
   6. Condition(s) when a shock hazard exists (e.g., "With cover off")
   7. Limited Approach Boundary as determined from NFPA 70E, Table 130.2(C)
   8. Restricted Approach Boundary as determined from NFPA 70E, Table 130.2(C)
   9. Prohibited Approach Boundary as determined from NFPA 70E, Table 130.2(C)
   10. Unique equipment designation or code (described under "Component Identification"
   11. Class for insulating gloves based on system voltage (e.g., Class 00 up to 500V)
   12. Voltage rating for insulated or insulating tools based on system voltage (e.g., 1000V)
   13. Date that the hazard analysis was performed.
   14. "Served from" circuit directory information including the serving equipment designation, location (e.g., room number), circuit number, and circuit voltage / number of phases / number of wires.
   15. If applicable, the "serves" circuit directory information including the served equipment designation, location (e.g., room number), circuit number, and circuit voltage / number of phases / number of wires.
   16. An abbreviated warning label may be used where it has been determined that no dangerous arc-flash hazard exists in accordance with IEEE 1584a ™, paragraph 9.2.3.
   17. Use a "DANGER" label where the calculated arc-flash incident energy exceeds 40 cal/cm.

E. Submittals: Submit four copies of coordination study and certified fault current study results to the Architect for review.

3.11 EQUIPMENT BACKBOARDS

A. Backboards: ¾ inch, fire retardant, exterior grade plywood, painted gray, both sides.
   1. Provide minimum of two 4-ft. by 8-ft. sheets of plywood for each new telephone equipment terminal location.
   2. Provide minimum of two 4-ft. by 4-ft. sheets of plywood for each new data / voice / video / communications equipment location / cable TV head end equipment, or security equipment location.

3.12 TESTING

A. The contractors for the various sub-systems shall submit proposed testing procedures for their systems, subject to review and approval and Owner acceptance. The contract will not be declared to be substantially complete until the functional operation of the subsystems have been demonstrated and verified and reports have been provided, reviewed and accepted.

B. The project will not be declared substantially complete until the following has taken place.
   1. The “As-Built” drawings have been submitted, reviewed and accepted by the Architect / Owner / Owner’s Construction Representative.
   2. The building emergency lighting system and other systems including but not limited to those listed below have been tested, completed factory start-up and programming and adjusting as required for a complete and fully operational system acceptable to the Architect and Owner.
      a. Occupancy Sensor and Lighting Controls
      b. Surge protective device equipment
      c. Overcurrent devices
      d. Motor Controllers
      e. Emergency Lighting
      f. Building Fire Alarm System

3.13 LOAD BALANCING

A. Balance the loads on each low-voltage feeder so that the voltage on each phase is within +/- 1.0% of the average voltage of the three phases. Refer to the DOE Office of Industrial Technologies, “Motor Tip Sheet #7” dated September 2005 available for download to PDF format at no charge at: http://www1.eere.energy.gov/industry/bestpractices/pdfs/eliminate_voltage_un_balanced_motor-systemts7.pdf

END OF SECTION

SECTION 26 05 09

ELECTRIC UTILITY COORDINATION AND SERVICE ENTRANCE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. General: Electrical service shall be provided by local utility company.

B. Power Company Data: Obtain from utility company information and installation standards for electrical service installation.

C. Responsibilities: Determine what equipment and labor is provided by utility company and what equipment and labor is required of this Contractor.

PART 2 - PRODUCTS

2.1 GENERAL

A. Service Data: Ensure that utility company service data is accurate and verified.

2.2 PRIMARY SERVICE

A. General: Division 26 shall provide primary service conduit, concrete transformer pads, concrete duct bank, utility service and metering equipment enclosures, manholes, and pull boxes as required and as specified.

B. Utility company shall provide primary cables, splices, utility metering instruments, terminations, and primary underground and overhead service conductors.

2.3 TRANSFORMERS AND SWITCHGEAR

A. General: Division 26 shall make provisions for service as required by utility company, including, but not limited to permanent or removable/lockable vehicular barriers, grounding rods, grounding conductors, and sleeves.

B. The utility company shall provide service transformers, primary switchgear, primary protective relaying, and connections to the customer service.

2.4 SECONDARY SERVICE CONDUCTORS

A. General: Division 26 shall provide secondary service entrance conductors, conduit and concrete duct bank.

2.5 SECONDARY SERVICE BUS WEATHERHEAD AND UTILITY METERING CURRENT TRANSFORER ENCLOSURES

A. General: Division 26 shall provide secondary service bus weatherhead and utility metering current transformer enclosures as specified and as approved by the utility company. Where required or specified, enclosure shall be constructed of aluminum or stainless steel NEMA 3RX construction.

B. Rack mounted bus weatherhead and current transformer metering enclosure shall be installed on W6x20 hot dipped galvanized vertical support structures with baseplates to a minimum 20-inch diameter by eight-feet-deep steel reinforced concrete pier foundation with anchor bolts. Hot dipped tubular steel cross members as required for equipment support. Support structure shall support approximately 1,200 pounds of equipment and minimum 150 MPH wind loading.

2.5 SECONDARY SERVICE CABLE TAP BOXES

A. General: Division 26 shall provide secondary service cable tap boxes only if required or specified and as approved by the utility company. Where required or specified, enclosure shall be

constructed of aluminum or stainless steel NEMA 3RX construction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Standards: The installation of the service entrance provisions shall comply with the published standards and requirements of the utility company, the utility company's specific construction requirements for this project, and with requirements of this Division.

B. Correction: Any failure to meet the standards and requirements shall be corrected to the satisfaction of the utility company and Owner without any additional cost to the Owner.

C. Contractor shall provide all construction materials and labor that the utility company determines to be the responsibility of the customer, at no additional cost to the Owner.

D. The materials and labor required by the for a complete installation shall be provided by the contractor and includes, but is not limited to permanent or removable / lockable vehicular barriers, grounding rods, grounding conductors, sleeves, concrete pads, concrete reinforced ductbanks, conduits, metering racks and metering enclosures.

E. Utility distribution poles and service entrance ductbank locations shall be staked and surveyed prior to pole installation by the Contractor to verify their proper placement is within the Owner's property and respective utility easements. Contractor shall verify by survey that the pole and service entrance ductbank location and easements do not interfere with existing easements, right-of-ways, or other restricted properties. Conflicts with existing easements and restrictions shall be brought to the attention of the Architect prior to construction.

F. Contractor shall initiate contact with the power provider (retail seller), utility (transmission and distribution), and Owner within 14 days of Notice to Proceed to ensure permanent power will be available to the site. Any delays resulting from lack of this coordination shall be the responsibility of the Contractor.

END OF SECTION

SECTION 26 05 10

CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions, mock-ups and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents. Submit a narrative outline of the Quality Control Program or Plan.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality. Persons performing electrical work shall be required to be licensed. There shall be on-site supervision at all times, including punch list work, with that person having a minimum of journeyman license. Helpers, apprentices shall have a minimum of apprentice license.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes matching approved samples; all exposed finishes shall be approved by the Architect / Engineer. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide manufacturer’s qualified personnel to observe:
1. Field conditions
2. Condition of installation
3. Quality of workmanship
4. Start-up of equipment
5. Testing, adjusting, and balancing of equipment

B. Manufacturer’s qualified personnel shall make written report of observations and recommendations to Architect / Engineer.

1.7 MOCK UPS

A. Assemble and erect the specified equipment and products complete, with specified anchorage and

support devices, seals and finishes.

B. Do not proceed with any work involving a mock-up, until the related mock up has been approved in writing.

C. Acceptable mock-ups in place shall be retained in the completed work where possible.

D. Perform tests and submit results as specified.

1.8 SCHEDULING OF MOCK-UPS

A. Schedule demonstration and observation of mock-ups, in phases, with Architect / Engineer.
1. Rough-in
2. Finish with all appurtenances in place
3. Demonstrations

B. Refer to other specification sections for pre-functional checklist for requirements to aid in preparing mock-ups.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL

A. Comply with recognized National rating and approval agencies as well as all codes and ordinances at the federal, state and city levels.

PART 3 - EXECUTION

3.1 ADJUSTMENTS AND MODIFICATIONS

A. Contractor shall provide all adjustments and modifications as requested by the manufacturer's qualified personnel at no additional cost to Owner.

B. Coordination Drawings:
1. Electrical room size and location required and to scale
2. Equipment and accessories, switchgear and piping
3. Indicate clearances and service access.

3.2 ELECTRICAL ACCEPTANCE TESTING

A. Perform electrical acceptance testing and inspections in accordance with the current edition of the International Electrical Testing Association (NETA), *Acceptance Testing Specification* (ATS).

B. Perform acceptance testing, inspection, function tests, and calibration to assure that installed electrical systems and components, both Contractor and user-supplied are:
1. Installed in accordance with design documents and manufacturer's instructions.
2. Tested and inspected in accordance with applicable codes and standards (e.g. NFPA 110 and NFPA 111).
3. Ready to be energized.
4. Operational within industry and manufacturer's tolerances.

3.3 INSPECTIONS BY LOCAL AUTHORITY HAVING JURISDICTION (AHJ)

A. Contractor shall notify design prime consultant and associated Architect / Owner's Construction Manager when he requests an inspection by the AHJ.

3.4 MOCK-UPS

A. Mock up the light fixture fireproofing for each type of light fixture to be located in fire rated ceilings. Demonstrate that the fire proofing material does not interfere with the mechanical operation of light fixture doors, hinges, or latches.

B. Mock up a typical panelboard backbox with Surge Protective Device (SPD) panelboard extension backbox or SPD device.

END OF SECTION

SECTION 26 05 12

ELECTRICAL SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 01 and as outlined below.

B. Provide individual submittals based on the project specification section number and description and only items specified or required in that specific project specification section.

C. Submit product data shop drawings only for the following items indicated below when included as part of the project specifications, and for items specifically requested elsewhere in the Contract Drawings and Specifications. Architect / Engineer reserves the right to refuse shop drawings not requested for review, typically for basic materials and commodity off-the-shelf materials, and/or to imply that materials shall be provided as specified without exception.

D. The term submittal, as used herein, refers to all:
1. Shop Drawings
2. Coordination Drawings
3. Product data

E. Submittals shall be prepared and produced for:
1. Distribution as specified
2. Inclusion in the Operating and Maintenance Manual, in the related O&M manual section.

1.2 ARCHITECT / ENGINEER REVIEW OF SUBMITTALS

A. The Architect / Engineer will:
1. Review requested submittals with reasonable promptness. Specific equipment submittal within a materials specification section that may be required to be expedited shall be submitted separately without other submittal items not requiring the same prompt attention.
2. Affix stamp and initials or signature and indicate requirements for resubmittal or exceptions to submittal as submitted.
3. Return submittals to Contractor for distribution or for resubmission.

B. Review of submittals will not extend to design data reflected in submittals that is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes, or coordination with the work of other trades.

D. The review of a separate item as such will not indicate approval of the assembly in which the item functions.

1.3 SUBSTITUTIONS

A. Do not make requests for product or material substitution employing the procedures of this Section. The procedure for making a formal request for substitution is specified in Division 01.

PART 2 - PRODUCTS

A. Each individual submittal shall be an individual specific electronic data file with the file name resembling the product specification section number and title. Refer to Division 01 for additional data file format and media requirements.

PART 3 - EXECUTION

3.1 SPECIFICATION COMPLIANCE REVIEW

A. Do not submit an outline form of compliance, submit a complete copy with the product data.

B. Mark up a complete copy of the complete specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer / Owner (Does Not Comply, Explanation:).

C. Variances for roduct ot materials typically include updated model numbers or updated versions of the specified product from the same manufacture or an equal or better product from the approved manufactures list. Substutions from manufacture's not on the approved manufacture's will not be reviewed unless prior approval using one of the procedures for substitutions or changes in the contract documents are followed as requried in Division 01.

3.2 COMPOSITE COORDINATION DRAWINGS

A. Produce a set of composite coordination drawings for above ceiling, below ceiling, and below floor of electrical, mechanical, and technology equipment rooms and equipment yards for review and comment within four (4) weeks of receipt of Owner's official Notice to Proceed. Show coordination of items including but not limited to structural and architectural elements, all mechanical and plumbing piping, ductwork, equipment, electrical conduit, low voltage communications and safety/security systems cabling, cable trays, lighting, electrical switchgear, generators and UPSs, and any public or private building utility services.
   1. Prepare the composite plans at one-quarter inch (1/4") equals one-foot scale. Include larger scale sections with vertical elevations of elements as required to confirm coordinate of all elements.
   2. For each room containing major electrical switchgear and each outside equipment area with major electrical switchgear and other equipment also include NEC working space, NEC equipment space, and NEC access to NEC working space, and housekeeping pad location and dimensions.
   3. Prepare coordination drawings to coordinate installations for efficient use of available space allowing for future additional equipment wherever possible, for proper sequence of installation, and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.
   4. Identify field dimensions. Show relation to adjacent or critical features of work or products.

B. Submit composite coordination shop drawings in plan, elevation and sections, showing receptacles, outlets, electrical and telecommunication devices in casework, cabinetwork and built-in furniture.
   1. Verify location of wiring devices and outlets, communication devices and outlets, safety and security devices, and other work specified in this Division.
   2. Coordinate with drawing details, site conditions, composite coordination drawings, and millwork other equipment shop drawings prior to installation.
   3. Submit coordination and shop drawings prior to rough-in and fabrication.

3.3 EQUIPMENT SHOP DRAWINGS AND PRODUCT DATA

A. Submittals shall not be combined or bound together with any other material submittal. Do not submit entire product catalogs, submit only specific data sheets indicating required product information and available product options or accessories.

B. Submittal Specification Information:
   1. Every submittal document shall bear the following information as used in the project manual:
      a. The related specification section number
      b. The exact specification section title
      c. Additional identifiers as required in Division 01.

2. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been submitted or delivered.

C. All product options specified shall be clearly indicated on the product data submittal. All options listed on the standard product printed data not clearly identified as either part of or not part of the product data submitted shall become part of the Contract and shall be assumed to be provided with the product submitted.

D. Mark each copy of standard manufacture's printed data to identify pertinent products, referenced to specification section and article number.

E. Show reference standards, performance characteristics and capacities; wiring diagrams and controls; component parts; finishes; dimensions and required clearances.

F. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete or strike through information not applicable.

G. Submit drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

H. Show all dimensions of each item of equipment in its to be installed assembled condition with all components assembled. Include a series of drawings of individual components as necessary for reference.

I. Identify field dimensions; show relation to adjacent or critical features or work or products.

J. Submit individually bound shop drawings and product data for the following when specified or provided.

K. The Fault Current and Overcurrent Device Coordination Analysis shall be submitted prior to other electrical switchgear dependent on the results of the study for specific product selection by the vendor or contractor for compliance with the study.
1. The emergency life safety power system equipment shall be fully coordinated as required by the NEC.
2. The AIC and WCR ratings of all products meet or exceed the available fault current at that equipment's location.
3. Electrical systems other than life safety power systems shall be coordinated as much as practicable while reducing arc flash energy as much as practical.

L. Required submittals when products are indicated or specified:
1. Fault Current and Overcurrent Device Coordination Analysis. Submit this analysis at a minimum of three (3) weeks prior to any overcurrent device submittal to allow review for modifications to overcurrent device product selection submittal based on the manufacture's analysis and recommendations. Manufacture's recommendations for code compliance equipment fault tolerance are a project requirement and shall be provided at no additional cost to the Owner. Manufacture's recommendations for arc flash reduction that result in no additional cost to the Owner shall be provided. Manufacture's recommendations for arch flash reduction which would result in additional cost to the Owner are considered recommendations only and will be reviewed by the Engineer during the submittal review and may or may not result in changes to the specified or submitted equipment.
2. Enclosed Switches, non-fused, fused, or circuit breaker
3. Panelboards
4. Load centers
5. Wiring devices
6. Lighting fixtures
7. Lighting Controls
8. Surge Protection Devices
9. Transformers
10. Electrical Contactors

11. Enclosed Motor Controllers
12. Site Lighting Photometrics, Poles, and Fixtures
13. Switchboards, including renewal components for existing switchboards.
14. Elevator Power Module fused switches.
15. Fuses
16. Recessed floor boxes and fittings
17. Metering equipment for building management energy monitoring, usage, IECC compliance
18. Modular metering equipment for multi-tenant utility electrical services
19. Emergency/Standby generators
20. Automatic transfer switches
21. Manual transfer switches with or without integral generator docking stations
22. Remote generator docking stations
23. Emergency lighting inverters
24. Theatrical Lighting Systems
25. Architectural Dimming Systems
26. Electrical cable trays
22. Sports Lighting Equipment, Photometrics, Fixtures, and Poles
27. Surface Raceways
28. Electrical controls and time switches
29. Motor control centers, including renewal components for existing motor control centers
30. Busway
31. Uninterrupted Power Supply systems
32. Power quality improvement filters or capacitors
33. Lightning protection system
34. Fire Rated Cables and Connectors

3.4 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, calibrating, balancing and finishing.

3.5 CONTRACTOR RESPONSIBILITIES

A. Review, make corrections or annotations for clarification of manufacturer supplied data, stamp and sign submittals prior to transmittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Manufacturer's catalog numbers
4. Conformance with the Contract Documents

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect / Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are required, until such submittals have been produced and bear contractor's stamp of acceptance or approval. Do not fabricate products or begin work until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors, omissions, or un-approved substitutions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect / Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations identified by the Contractor on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
1. Proper sizes and capacities

2. That the item will fit in the available space in a manner that will allow proper service; manufacture’s and code required clearances.
3. Construction methods, materials and finishes

I. Schedule submissions at least 15 days before date reviewed submittals will be needed by the Contractor for processing or for making corrections for re-submittal.

J. General and Electrical Contractor’s Stamp of Approval
1. The general contractor and the electrical contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.
2. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect / Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.
3. Do not deliver any submittals to the Architect / Engineer that do not bear the Contractor's stamp of approval and signature.
4. Submittals delivered to the Architect / Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

3.6 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor. Product and equipment related to site work or other trades which require extensive rough-in, foundations, or structural support shall be submitted as soon as possible after given notice to proceed with construction.

B. Number of submittals required:
1. Coordination Drawings: Submit one electronic data file (pdf) and three opaque reproductions or coordination drawings.
2. Product Data: Submit electronic data PDF files. Refer to Division 01 for specific requirements. PDF files that are 20MB or larger may indicate that a submittal includes information not specifically relevant to the specific product being provided, information not required for the review of the specific product such as a complete product catalog or catalog section. Contractor shall include only the product data required to review the specific products characteristics for compliance with the contract documents.

C. Accompany submittals with transmittal letter containing:
1. Date
2. Project title and number
3. Contractor's name, address and contact information.
4. The number of each Shop Drawing, Project Datum and Sample submitted
5. Other pertinent data as required in Division 01.

D. Submittals shall include:
1. The date of submission
2. The project title and number
3. Contract Identification
4. The names of:
   a. Contractor
   b. Subcontractor
   c. Supplier
   d. Manufacturer
5. Identification of the product
6. Field dimensions, clearly identified as such
7. Relation to adjacent or critical features of the work or materials
8. Applicable standards
9. Identification of deviations from contract documents
10. Suitable blank space for General Contractor and Architect / Engineer stamps

11. Contractor's signed and dated Stamp of Approval.

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
1. Finishes which involve Architect / Engineer selection of colors, textures or patterns
2. Associated items requiring correlation for efficient function or for installation

3.7 RESUBMISSION REQUIREMENTS

A. Make resubmittals under procedures specified for initial submittals. Re-submittals shall be a complete submittal as if it were the initial submittal unless otherwise instructed in the review comments on the original submittal.
1. Indicate that the document or sample is a resubmittal
2. Identify changes made since previous submittals

B. Indicate any additional changes which have been made by the contractor other than those requested by the Architect / Engineer.

END OF SECTION

SECTION 26 05 16

EXCAVATING, BACKFILLING AND COMPACTING FOR ELECTRICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 apply to this section.

B. Refer to Instructions for substitution of materials and products.

C. Addenda issued during the bidding period that affect this section of the specifications.

1.2 WORK INCLUDED

A. Coordinating all excavating and backfilling for the electrical underground, and all related appurtenances. Provide concrete duct banks as specified in other related Division 26 specification sections.

B. The extent of raceways, excavation, and backfill shall be in conformance with the locations, raceways, elevations and grades shown on the drawings.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) Use current edition.
1. ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
2. ASTM D1556, Standard Test method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
3. ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
4. ASTM D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

B. Local Authority Having Jurisdiction Standards

C. Local Governing Agencies or Utilities

1.4 WARRANTY

A. Provide written warranty against defects in the material and workmanship for the work of this Section for a period of one year from the Date of Substantial Completion of the Project. Refer to Division 1 for Warranty form.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Concrete: Refer to other Division 26 specification section where concrete encasement is required or specified.

B. Cement-Stabilized Sand: Clean, local sand mixed with not less than 1-1/2 sacks of Portland cement per ton; mix in a mill-type mixer.

C. Sand: Clean, local sand

D. Earth Backfill: Clean local material consistent with the surrounding earth material and free of large clods, roots, organic materials, rocks or other debris.

PART 3 – EXECUTION

3.1 EXCAVATION

A. General:
1. All utility trenches shall be constructed in conformance with OSHA trench safety standards.
2. Refer to project Geotechnical Report for additional requirements for excavating and backfilling of utility trenches.
3. Sheeting and shoring shall be accomplished to the extent necessary to maintain the sides of the trench in a vertical position throughout the construction period for trenches five feet in depth or deeper. Where approved, trench sides may be laid back in lieu of shoring to meet OSHA safety standards.
4. Utilities shall not be constructed or laid in a trench in the presence of water. All water shall be sufficiently removed from the trench prior to the raceway placing operation to ensure a dry, firm bed on which to place the raceway.

B. Appurtenances:
1. Any overdepth excavation below appurtenances shall be refilled with cement-stabilized sand.

C. Electrical Trenches:
1. Electrical underground raceways must be the minimum depth required by the local governing authority and Power Company.
2. Trench width for the electrical raceway shall be a minimum of the outside raceway encasement plus 12 inches.
3. Trenches shall be excavated to a depth of at least 6 inches below the conduit raceway. The conduit raceway bedding or concrete encasement shall then be placed in accordance with the specifications, local governing authority, and Power Company standard details.

3.2 BEDDING AND BACKFILL

A. Electrical Trenches:
1. Place backfill, consisting of sand or cement stabilized sand, to a depth of one foot above top of raceway or concrete duct bank and compact to 90% maximum density.
2. Backfill the remainder of the trench in 6 inch lifts with select excavated material and compact as required to achieve density of soil of surrounding area.

B. Utility Locators:
1. Provide metallic locators for utility company raceways as required by respective utility.
2. Refer to other specification sections for additional requirements for underground raceway locators and markers.

END OF SECTION

SECTION 26 05 19

CONDUCTORS AND CONNECTORS – 600 VOLT

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide electrical conductors, wire and connector work as shown and specified manufactured in the USA.

B. Types: The types of conductors and connectors required for the project include the following:
1. 600V building conductors
2. 600V building conductor connectors
3. 600V 2-hour fire rated power cable

C. Application: The applications for conductors and connectors required on the project are as follows:
1. Power distribution circuitry
2. Lighting branch circuitry
3. Appliance, receptacle, and equipment branch circuitry
4. Motor branch circuitry
5. Control wiring
6. Line voltage

D. Refer to other specific specification sections for voice, video, data, alarm and instrumentation cables.

1.2 QUALITY ASSURANCE

A. UL Label: Conductors and connectors shall be UL labeled.

1.3 REFERENCES

A. Refer to other specific specification sections regarding specialized wiring and connections.

PART 2 – PRODUCTS – Provide products manufactured in the USA

2.1 CONDUCTORS AND CONNECTORS

A. General: Except as indicated, provide conductors and connectors of manufacturer's standard materials, as indicated by published product information, designed and constructed as instructed by the manufacturer, and as required for the installation.

B. Conductors: Provide factory-fabricated conductors of the size, rating, material, and type as indicated for each use. Conductors shall be soft or annealed copper wires meeting, before stranding, the requirements of ASTM B 3, Standard Specification for Soft or Annealed Copper Wire for Electrical Purposes, latest edition.
1. Conductors for control wiring sized #14 AWG through #10 AWG shall be stranded.
2. Conductors for power and lighting shall be stranded. Stranding shall be Class B meeting the requirements of ASTM B 8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft.

C. Insulation for standard building conductors: Insulation shall meet or exceed the requirements of UL 83, Standard for Thermoplastic Insulated Wires.
1. All wiring inside lighting fixtures shall be temperature rated per NEC.
2. Insulation for copper conductors shall be UL Type THHN/THWN, 90 degrees C.

D. Insulation for 2-hour fire rated power cables: Insulation shall meet or exceed the requirements of UL 2196 Fire Test for Electrical Circuit Protection Systems, and UL 44, Standards for Fire Resistive Cable. Conductor ampacity shall be based on 75C. Combination UL Type insulation types are permissible where the required UL Type is part of the combination UL listing.

1. Conductors installed underground: Insulation for underground fire rated conductors shall be wet location, UL Type RHW 75 degrees C, or UL RHW-2 90 degrees C.
2. Conductors installed above ground: Insulation for above ground fire rated conductors shall be UL Type RHH 90C or RHW 75C or UL RHW-2 90C.
3. Electrical Circuit Protective Systems (FHIT) – System 27 of the UL Fire Resistance Directory

E. Cable Lubricant: Fire resistant, nonflammable, water-based type for standard building conductors. Provide cable lubricants for fire rated cables as recommended by the cable manufacturer.

2.2 COLOR CODES FOR CONDUCTORS FOR BRANCH CIRCUITS AND FEEDERS

A. Color coding for conductors as required by NEC 210.5. Color coding for phase and voltage shall be as required by local codes and local standards. Where such standards do not exist, color coding shall be as follows:

Color Code Table	USE CONTINUOUS COLOR-CODED INSULATION THROUGHOUT					
System/ Phase	A	B	C	N	G	IG
120/208 3 Ph	Black	Red	Blue	White	Green	Green/Yellow Stripe
120/240 3 Ph	Black	Orange	Blue	White	Green	Green/Yellow Stripe
120/240 1 Ph	Black	N/A	Blue			
277/480	Brown	Purple	Yellow	Gray	Green	Green/Yellow Stripe

Notes to Color Code Table:
1. 120/208, 120/240, and 277/480 Volt Systems shall be routed in separate raceways.
2. Switched legs of phase conductors for lighting and appliance branch circuits shall be of the same color as described above throughout the entire circuit.
3. Conductors shall be the same color from breaker to device or outlet.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install electrical conductors and connectors as shown, in accordance with the manufacturer's written instructions, the requirements of NEC, the NECA Standard of Installation, and industry practices.

B. Coordination: Coordinate conductor installation work with electrical raceway and equipment installation work, as necessary for interface.

C. Conductors:
1. Provide a grounded (neutral) conductor for each branch circuit. Do not share grounded (neutral) conductors.
2. No more than six phase conductors shall be installed in a single raceway. Any combination of phase conductors and grounded (neutral) conductors in any raceway shall not exceed nine.
3. When any combination of four or more phase and grounded (neutral) conductors are installed in a raceway, the minimum size for all conductors including equipment ground conductor shall be #10 AWG, and they shall be de-rated accordingly.
4. When more than four (4) conductors are size #10 AWG, they shall be installed in a one-inch conduit.
5. Pull conductors together when more than one is being installed in a raceway. Whenever possible, pull conductors into their respective conduits by hand. Use pulling lubricant when necessary.

6. Before any conductor is pulled into any conduit, thoroughly swab the conduit to remove foreign material and to permit the wire to be pulled into a clean, dry conduit.
7. Run feeders their entire length in continuous section without joints or splices.
8. No wire smaller than #12 AWG shall be permitted for any lighting or power circuit. No wire smaller than #14 AWG shall be used for any control circuit, unless shown otherwise.
9. Provide the same size wire form the panelboard to last outlet on circuit. For 20 amp branch circuits operating at 150V or less, provide #10 AWG wire when the first outlet is over 75-feet from the panelboard. For branch circuits operating at 150 to 600 volts, provide #10 AWG wire when the first outlet is over 150-feet from the panelboard.
10. Branch circuit voltage drop shall not exceed 3% of rated voltage.
    a. Total voltage drop from the point of service to the last outlet or utilization equipment of the same voltage shall not exceed five-percent of rated voltage.
    b. Total voltage drop from the point of service to transformers with adjustable taps, buck-boost transformers, uninterruptable power supplies (UPS), or voltage regulators shall not exceed five-percent of rated voltage.
    c. Total voltage drop from a separately derived system, transformer with adjustable taps, buck-boost transformer, uninterruptable power supply (UPS), or voltage regulator to the last outlet or utilization equipment of the same voltage shall not exceed five-percent of rated voltage.
    d. Total voltage drop from the point of service to distribution equipment of the same voltage shall not exceed two-percent of rated voltage.
    e. Branch circuit voltage drop from distribution equipment to the last outlet or utilization equipment shall not exceed three-percent of rated voltage.
    f. Provide the same size branch circuit conductors to last outlet on circuit unless specifically noted or indicated otherwise on the drawings. For 20 amp branch circuits operating at 150-Volts or less, provide #10 AWG wire when the first outlet is over 75-feet from the panelboard. For branch circuits operating above 150-Volts to 600-Volts, provide #10 AWG wire when the first outlet is over 150-feet from the panelboard.
11. No tap or splice shall be made in any conductor except in outlet boxes, pull boxes, junction boxes, splice boxes, or other accessible locations. Make taps and splices using an approved compression connector. Insulate taps and splices equal to the adjoining conductor. Make splices or taps only on conductors that are a component part of a single circuit, protected by approved methods. Taps or splices in feed through branch circuits for connection to light switches or receptacles shall be made by pigtail connection to the device.
12. Support conductors in vertical raceways, as required by the NEC.
13. Do not permit conductors entering or leaving a junction or pull box to deflect to create pressure on the conductor insulation.
14. Make joints in branch circuits only where circuits divide. These shall consist of one through circuit to which the branch from the circuit shall be spliced.
15. Make connections in conductors up to a maximum of one #6 AWG wire with two #8 AWG wires using twist-on pressure connectors of required size.
16. Make connections in conductors or combinations of conductors larger than specified using cable fittings of type and size required for specific duty.
17. After a splice is made, insulate entire assembly with UL-approved insulating tape to a value equivalent to the adjacent insulation.
18. Make splices and connections in control circuit conductors using UL-approved solderless crimp connectors.
19. All conduits shall be installed with an insulated grounding conductor per NEC 250.122. Where green conductor insulation is not available, the ground conductor shall be identified with green phasing tape at all accessible locations.
20. Neatly train and lace wiring inside boxes, equipment and panelboards. Provide tie-straps around conductors with their shared neutral conductor where there are more than two neutral conductors in a conduit.
21. Clean conductor surfaces before installing lugs and connectors.
22. Make splices, taps and terminations to carry full ampacity of conductors with no perceptible temperature rise.
23. Provide stranded conductors connected with pressure type connectors / compression fittings and terminal lugs UL listed for the type of conductor used (AL-CU) and correctly sized to the diameter of the bare conductors.

24. Run mains and feeders their entire length in continuous pieces without splices or joints.
25. Color code conductors.
26. Do not install a pull string in conduits containing conductors.
27. Conductors shall be the same color from load side of overcurrent protection device to outlet or utilization equipment.
28. Spare conductors shall not be installed in any conduit, gutter, raceway, panel or enclosure unless noted otherwise.

D. Two-hour fire rated cable:
1. Two-hour fire rated power cable shall be installed per manufacturer's installation instructions in compliance with UL Fire Resistance Directory, Electrical Circuit Protective Systems (FHIT), and System 27.
2. Two-hour fire rated power cable shall be installed in rigid steel EMT or rigid steel galvanized conduit (RGC) with steel fittings. Provide fire rated sealant to the end of the raceway to prevent gases from migrating from the fire rated cable into the equipment.
3. Provide two-hour rated cable where conduit or cables enters or passes through the building envelope at areas or rooms that are not two-hour rated equipment rooms for the following:
   a. Fire Pump feeders.
   b. Emergency Feeders (Life Safety) as defined by NFPA Article 700.
   c. Legally required level one standby systems as defined by NFPA 110 and NFPA Article 701. These systems include but are not limited to those used to aid firefighting and rescue operations, smoke removal systems, and elevators designated for ADA and/or fire rescue operations.
4. Alternate two hour rated feeder conductor sizes may be substituted for the required conductor ampacity, voltage drop, or equipment lug terminations based on two-hour fire rated conductor standard size availability or provided equipment manufacturer's cable terminations. The substituted conductor ampacity shall meet or exceed the specified cable ampacity and exceed the required equipment minimum circuit ampacity. Provide substitutions and the required conduit sets and sizes as required for the substitutions at no additional cost to the Owner.

E. Identification: Label each phase conductor in each junction box with corresponding circuit number, using self-adhesive wire markers.

F. Splices and Joints:
1. In accordance with UL 486A, C, D, E, and NEC.
2. Aboveground Circuits (No. 10 AWG and smaller):
   a. Connectors: Solderless, screw-on, reusable pressure cable type, rated 600 V, 220˚ F, with integral insulation, approved for copper and aluminum conductors. Push-in type connectors are prohibited.
   b. The integral insulator shall have a skirt to completely cover the stripped wires.
   c. The number, size, and combination of conductors, as listed on the manufacturers' packaging, shall be strictly followed.
3. Motor connections:
   a. All AHU motors connections shall be split bolt connectors.
   b. All non-AHU motors 10 HP and larger shall be split bolt connectors.
   c. All non-AHU motors less than 10 HP shall be split bolt connectors or as recommended by the manufacturer.

G. Aboveground Circuits (No. 8 AWG and larger):
1. Connectors shall be indent, hex screw, or bolt clamp type of high conductivity and corrosion resistant material, listed for use with copper and aluminum conductors.
2. Provide field-installed compression connectors for cable sizes 250 kcmil and larger with not less than two clamping elements or compression indents per wire.
3. Insulate splices and joints with materials approved for the particular use, location, voltage, and temperature. Splice and joint insulation level shall be not less than the insulation level of the conductors being joined.
4. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.

H. Underground Branch Circuits and Feeders:
1. Submersible connectors in accordance with UL 486D, rated 600 V, 190˚F, with integral insulation.

3.2 TESTING

A. Pre-Energization Check: Before energizing, check cable and conductors for circuit continuity and short circuits. Correct malfunctions.

B. Service Entrance and Feeder Insulation Resistance Test: Each main service entrance conductor and each feeder conductor shall have its insulation resistance tested after the installation is complete except for connection at its source and point of termination. Testing shall be performed by qualified technicians who have been trained in testing procedures and in the use of all test equipment.
1. Make tests using a Biddle Megger or equivalent test instrument at a voltage of not less than 1000 VDC; measure resistance from conductor to conductor, conductor to neutral (if present) and from conductor to ground. Insulation resistance shall not be less than the following:

Wire Size (AWG)	Insulation Resistance (Ohms)
#8	250 K
#6 through #2	100 K
#1 through #4/0	50 K
Larger than #4/0	25 K

2. Conductors that do not meet or exceed the insulation resistance values listed above shall be removed, replaced, and retested.

C. Submittals: Contractor shall furnish instruments and personnel required for tests. Submit 4 copies of certified test results to Architect for review. Test reports shall include conductor tested, date and time of test, relative humidity, temperature, and weather conditions.

D. Voltage and Current Values: The voltage and current in each conductor shall be measured and recorded after connections have been made and the conductor is under load.

SAMPLE DC HIGH VOLTAGE CABLE TEST REPORT
(Specification Paragraph 3.2, C)

Date_____

Contract and Work Location: _____
Contract (Project) No.: ___
Circuit Identification: _____
(Dwg., Title, Number and Ckt. Number)

Test Equipment: _
(Make, Model, Serial No., Etc.)
Applied Test Voltage _____
Normal Oper. Voltage _____
Cable Installation: New _____ Used _____
(Date) (No. Years)
Cable Size _____AWG
Cable Length _____Ft.
Cable Material _____Cu _____Al
Temperature _____ Humidity _____

TEST DATA - RESISTANCE IN KILO OHMS

CONDUCTOR PER PHASE	A-N	B-N	C-N	A-G	B-G	C-G	A-B	B-C	A-C

END OF SECTION

SECTION 26 05 26

ELECTRICAL GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Grounding shall conform to the requirements of:
   1. National Electrical Code.
   2. Governing local codes.
   3. All Local Utility Companies

B. Ground effectively and permanently.
   1. Neutral conductor at the main service disconnect and other separately derived systems.
   2. All conduit systems.
   3. All electrical equipment and related current carrying supports or structures.
   4. All metal piping systems.
   5. All building structural metal frames.
   6. All telephone/voice/video/CATV/data utilities

1.2 REFERENCE STANDARDS

A. ANSI/IEEE Standard 142 - "Recommended Practice for Grounding of Industrial and Commercial Power Systems."

B. ANSI/UL 467 - "Safety Standard for Grounding and Bonding Equipment."

C. Article 250 of the NEC (NFPA 70) for grounding.

D. NECA – Standard of Installation

E. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

F. EIA / TIA 607

G. NFPA 99 Standard for Health Care Facilities

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Copperweld

B. nVent ERICO

C. Burndy

D. O. Z Gedney

E. Eaton

2.2 GROUNDING ELECTRODES

A. Driven Rod Electrode
   1. 3/4" x 10'-0" copper clad grounding electrode.
   2. UL listed.
   3. Approved thermal fusion connector methods (exothermic).

B. Metal frame of building or enclosure.

C. Foundation concrete encased rebar.

2.3 DATA / VOICE COMMUNICATIONS CLOSET GROUND BAR

A. MDF closets/head end rooms: Erico Cadweld #B544A028 ground bar with 7/16-inch holes.

B. IDF closets, Erico Cadweld #B542A004 ground bar with 7/16-inch holes.

C. Heavy-duty, two bolt type, copper alloy or bronze for grounding and bonding applications, in configurations required for particular installation.

2.4 EXOTHERMIC CONNECTIONS

A. Exothermic type for underground and structural steel; Cadweld

B. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

2.5 WIRE

A. Stranded, copper cable

B. Foundation Electrodes: 4/0 AWG

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements

PART 3 - EXECUTION

3.1 GROUNDING AND BONDING

A. In the service equipment, provide a separate (dedicated) ground bus.
   1. Bond the ground bus with copper bus bar or cable, of equal or greater current carrying capacity of the service grounding conductor, to the neutral bar.
   2. Resistance of neutral to ground shall not exceed 10 Ohms.
   3. Connect the electric service grounding electrode conductors to the incoming metal water pipe system (when available, using a suitable ground clamp) and to a supplemental electrode such as a ground rod or ground .ring.
   4. Provide grounding and bonding at the power company’s metering equipment.
   5. Provide access and cover for access to the ground grid and removable connections for testing the system.

B. Connect the grounding electrode conductor between the ground bus and the grounding electrode system.
   1. In rigid PVC conduit.
   2. Provide thermo fusion connection for each rod ground electrode.
      a. All rod electrodes shall be located outside the building in non-paved areas where available. Access cover top shall be flush with finish grade or floor.
      b. Install rod electrodes as required. Install additional rod electrodes as required to achieve specified resistance to ground.
      c. The minimum distance between driven ground rod electrodes shall be 10'.
   3. The total ground resistance shall not exceed 10 Ohms for service entrance grounds and 25 Ohms for equipment grounds.
      a. Where this condition cannot be obtained with one electrode, install a longer electrode, deep-driven sectional electrodes, or additional grounding electrodes until the required ground resistance is obtained.

C. Provide an insulated equipment grounding conductor inside all conduits, raceways, surface raceways, gutters and wireways. The ground wire shall be bonded to each box to suitable lug, bus, or bushing. All bonding jumpers shall be routed inside conduit or raceway.

D. Provide an insulated isolated equipment grounding conductor in addition to the insulated equipment

grounding conductor for all isolated grounding feeders, branch circuits, outlets and isolated grounding receptacles.

E. Provide all conduit terminating in switchgear, transformers, switchboards, panelboards and voice/data outlets with grounding bushings, where required, and ground wire extended to ground bus in equipment. Install grounding bushings where reducing washers are used and concentric and eccentric knock-outs are used.

F. Main bus and building grounding electrode conductor installation shall be witnessed by the Architect / Engineer.

G. Provide bonding to meet Regulatory Requirements.

H. Interface with lightning protection system when lightning protection system is specified.

I. Locate and install anchors, fasteners, and supports in accordance with NECA “Standard of Installation”.

J. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

K. Do not use spring steel clips and clamps.

L. Do not use powder-actuated anchors.

M. Do not drill or cut structural members.

N. Do not use compression or mechanical connectors underground.

O. Do not use sheetmetal or self-drilling screws for bonding connections. Provide listed or approved connectors.

P. Provide grounding access well for each driven ground electrode, not located in manholes or pull boxes.
1. Access well top shall be flush with finish paved surfaces.
2. Ground access wells located in non-paved areas shall be set two-inches above surrounding finished grade. Provide 12-inch wide by 8-inch deep reinforced concrete crown around neck or opening and sloped down away from pull box opening.
3. Provide thermal fusion (exothermic) connectors approved for direct burial.

3.2 METAL FRAME OF BUILDING OR STRUCTURE

A. Effectively ground the building steel or structure per NEC 250-52 (2).

3.3 UFER GROUND

A. Provide a UFER ground at bottom of building slab per NEC 250.52 (3), bond to building steel.

3.4 GROUND RING

A. Provide an electrically continuous ground system consisting of minimum of #4/0 copper main ground ring and ground rod stations with the bare copper conductors connected to the ground rod stations. Verify that the resistance to ground between any points on the system does not exceed 3 Ohms. Provide ground rod stations at each corner of the building.

B. Install the ground conductors in contact with the earth below the frost line or a minimum of 30 inches, whichever is deeper.

C. Bond ground ring to building steel at every other building perimeter steel column.

3.5 MISCELLANEOUS REQUIREMENTS

A. Continuity of the equipment grounding system shall be maintained throughout the project.

Equipment grounding jumpers shall be installed across conduit expansion fittings, liquid-tight flexible metal and flexible metal conduit, and other non-electrically continuous raceway fittings.

B. Equipment grounding conductors and grounding electrode conductor shall be stranded copper conductors and run in a suitable raceway. Grounding conductors and grounding electrode conductor shall be continuous, without joints or splices over their entire length, except as allowed by NFPA 70/NEC.

C. For separately derived alternating current system grounds, bond the case and neutral of each transformer secondary winding directly to the nearest available effectively grounded structural metal member as required in NEC 250.

D. Exterior Electrical Equipment Racks:
1. Provide driven ground electrode.

E. Technology/Data/Voice Communications, CATV, CCTV, and MATV Equipment Grounding: Provide grounding electrode conductor from the communications service equipment to the building grounding system as required. Grounding shall conform to ANSI/TIA/EIA 607(A) – Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code®, ANSI/NECA/BICSI-568 and manufacturer's grounding requirements as minimum. Bonding shall be of low impedance to assure electrical continuity between bonded elements.
1. MDF Closets Telecommunications Main Ground Bar (TMGB): Provide Erico #EGBA14424MM ground bar, wall mounted to the telecommunications plywood backboard. Provide one #3 AWG insulated ground conductor from ground bar to building steel. Provide #2/0 AWG insulated ground conductor to the building electrical service ground at the nearest electrical switchboard or panelboard.
2. IDF Closets Telecommunications Ground Bar (TGB): Provide Erico #EGBA14410FF ground bar mounted to the telecommunications plywood backboard. Provide one #6 AWG insulated ground conductor from ground bar to building steel and to ground bus of nearest electrical panelboard or switchboard.
3. Provide #2/0 AWG insulated ground conductor between each TMGB and all TGBs.
4. Provide #2/0 AWG insulated ground conductor from TMGB to electrical service ground bus at main electrical service switch.
5. Bond each equipment rack, cabinets, frames, together and with #6 AWG insulated ground conductor to the local TMGB / TGB. Bond and ground equipment racks, housings, messenger cables, raceways, and rack-mounted conduit.
6. Route TMGB – TGB ground conductor using the shortest, straightest, route practical with long radius curves.
7. All conduits terminating to cable trays, wireways, and racks shall be mechanically fastened. When connected to a cable tray or rack, it must be connected with ground bushings, wire bonded to the tray or rack, and grounded to the main building grounding system or IDF room grounding bar using #6 AWG copper.

F. Ground lighting fixture bodies to the conduit grounding system.

G. Bond receptacle ground to the box and conduit ground system, except where and insulated/isolated grounding receptacle or outlet is specified.

H. Ground connections to building steel, grounding electrodes and all underground connections shall be by thermal fusion (exothermic).

I. Provide OZ Type "BJ" bonding jumper at all expansion joints, points of electrical discontinuity or connections in conduit where firm mechanical bond is not possible, such as flexible connections, insulating couplings, etc.

J. Ground each lighting and power panelboard by connecting the grounding conductors to the grounding stud.

K. Ground each secondary dry-type transformer to the ground bus of the primary side panelboard. Provide a bonding jumper between the ground stud and the neutral. Ground transformer ground stud to ground ring if a ground ring is installed or the nearest structural steel member.

L. Bond every item of equipment served by the electrical system to the building equipment ground system. This includes, but is not limited to, switchboards, panelboards, disconnect switches, receptacles, cable trays, controls, fans, air handing units, pumps and flexible duct connections.

M. Ground each light pole, power distribution poles, and metal conduit stub-ups at each light pole base.

N. Ground all metal conduit including metal conduit used for bends and penetrations through concrete.

O. Bond hot water and cold water piping together at each domestic water heater.

3.6 MANHOLE AND/OR PULL BOX GROUNDING

A. Provide a driven ground rod and ground bond ring in each power and telephone manhole or pull box. Bond cable racks and medium voltage cable shields at splices and terminations, ductbank conduit ground bushings and all other metal components in manholes or pull box to the ground ring.

3.7 COORDINATION

A. General: Coordinate installation of grounding connections for equipment with equipment installation work.

3.8 TESTING

A. Ground Resistance Test: Perform a ground resistance test for comparison to future inspection and testing data by the Owner. Test shall be performed using a Biddle Megger Earth Tester or equivalent test instrument. The test shall not be performed within 48 hours after the last rainfall.
   1. Inspect and test in accordance with NETA ATS except Section 4
   2. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13

B. True Root Mean Square (RMS) AC measurements: The True RMS AC Measure test should be performed for all bonding conductors. The recommended maximum AC current value on any bonding conductor should be less than 1 ampere (A). The recommended maximum DC current value should be less than 500 milliamperes (mA). If abnormally high AC current levels are present on any bonding conductor, a dangerous faulty wiring condition likely exists within the room.

C. Two-Point Bonding Measurements: The Two-point Bonding test should be performed for all bonding conductors. This test should be performed using an earth grounding resistance tester configured for a continuity test. The test is performed by connecting the meter leads between the nearest available grounding electrode (e.g., structural steel) and the TMGB or TGB. The recommended maximum value for the bonding resistance between these two points is 0.1 Ohms (100 milliohms).

D. Submittals: Furnish instruments and personnel required for tests. Personnel shall be trained in all aspects of testing grounding systems and shall be formally trained on using all test equipment required. Submit 2 copies of certified test results for Owner's record and submit 4 copies of certified test results to Architect / Engineer for review. Test reports shall include date and time of tests, relative humidity, temperature, and weather conditions.

E. Notify Owner’s Commissioning Authority (CxA) prior to performing any tests to the CxA may witness tests at his/her discretion. Refer to Section 26 01 00 Commissioning of Electrical Systems.

END OF SECTION

SECTION 26 05 33

CONDUIT SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install a complete system of electrical conduits and fittings.

1.2 REFERENCE STANDARDS

A. National Electrical Code

B. Local codes and ordinances

C. UL

D. ETL

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – Provide products manufactured in the USA

A. Raceways:
1. Allied, International Metal Hose, Ipex, Heritage Plastics, Wheatland, Can-Tex, Carlon, Certain-Teed, Anamet, Inc., Electri-Flex Co., Western Tube and Conduit, Sentinel Conduit.
2. PVC Coated RGC: Robroy Perma Cote, Robroy Plasti-Bond, or Calbond – no exceptions
3. Stainless Steel: Robroy, Calbrite, Gibson
4. Aluminum: Penn Aluminum, American Conduit, Wheatland, Eaton B-Line, Patriot Aluminum Products
5. Reinforced Thermosetting Resin Conduit (RTRC): FRE Composites, Champion Fiberglass, United Fiberglass

B. Fittings:
1. Appleton, Crouse Hinds, Topaz, Steel City, O.Z. Gedney, Carlon, Heritage Plastics, Raco, Ipex, International Metal Hose, Lew Electric Fittings Co.
2. PVC Coated ferrous fittings: Robroy Perma Cote, Robroy Plasti-Bond, or Calbond – no exceptions
3. Stainless Steel: Robroy, Calbrite, Gibson, Crouse Hinds
4. Aluminum: Penn Aluminum, American Conduit, Wheatland, Eaton B-Line, Patriot Aluminum Products
5. Reinforced Thermosetting Resin Conduit (RTRC): FRE Composites, Champion Fiberglass

C. Condulets and Conduit Bodies:
1. Appleton, Form 85
2. PVC Coated: Robroy Perma-cote or Plasti-Bond, – no exceptions
3. Stainless Steel: Robroy, Calbrite, Gibson, Crouse Hinds
4. Reinforced Thermosetting Resin Conduit (RTRC): FRE Composites, Champion Fiberglass

D. Steel MC Cable for light fixture whips:
1. AFC
2. Southwire
3. General Cable
4. Kaf-Tech

2.2 GENERAL

A. The minimum conduit size shall be ¾-inch unless indicated otherwise in Divisions 26, 27 or 28.
1. Branch Circuits: Minimum conduit size shall be ¾-inch.
2. Feeder Circuits: Minimum conduit size shall be ¾-inches.

3. Technology, telecommunications, and low voltage systems: The minimum conduit size shall be ¾-inches unless noted or indicated otherwise.
4. The minimum conduit size between buildings for technology, voice, data, fire alarm, video, security, surveillance, BMCS, and other telecommunications shall be 2-inch unless indicated otherwise.

B. The minimum conduit size for flexible metallic conduit for tap connections to individual light fixtures shall be ½ inch, or steel metal clad (MC) cable with insulated ground conductor maximum 6 feet.

C. Electrical nonmetallic tubing, flexible polyethylene or PVC tubing shall not be used on this project.

D. BX and AC cable shall not be used on this project.

E. PVC elbows shall not be used on this project.

F. Intermediate metal conduit (IMC) shall not be used on this project.

2.3 RIGID METAL CONDUIT

A. UL labeled, Schedule 40:
1. Mild steel pipe, zinc coated inside and out
2. Aluminum Alloy 6063, T-1 temper
3. Threaded ends
4. Insulated bushings

B. Fittings shall meet the same requirements as rigid metal conduits.
1. UL labeled
2. Threaded fittings

2.4 ELECTRICAL METALLIC TUBING (EMT)

A. UL labeled, standard weight:
1. Cold rolled steel tubing, zinc coated inside and out
2. Aluminum Alloy 6005, 6063. Temper T-1

B. Fittings shall meet the same requirements as EMT conduits.
1. UL labeled
2. Insulated throat connectors
3. Steel fittings with setscrews with lock nuts on threaded ends, no snap locks
4. Cast metal fittings are not approved
5. Uni-couple type connectors are not approved
6. Split ring, anti-short bushings are not approved

2.5 RTRC CONDUIT FITTINGS AND CONDUIT BODIES

A. UL listed

B. Standard wall thickness sizes ¼-inch through 4-inch

C. Underground medium wall thickness sizes 5 and 6-inch

D. Conduit interface joints above grade, gasket joint below grade

E. Extra heavy wall for above ground and/or UL Class 1 Division 2 and Class 1 Zone 2 applications.

2.6 PVC COATED RIGID STEEL WITH URETHANE INTERIOR COATING

A. The PVC coated galvanized rigid conduit and fittings must be ETL Listed and Verified. The PVC coating must have been investigated and verified by ETL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be ETL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic

coating must be UL listed for the hazard conditions to which they are to be used. All conduit and fittings must be new, unused material. Applicable UL standards may include UL 6 Standard for Safety, Rigid Metal Conduit, and UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.

B. The PVC coated galvanized rigid conduit and fittings must be ETL Verified to the Intertek ETL SEMKO High Temperature H_2O PVC Coating Adhesion Test Procedure for 200 hours. The PVC coated galvanized rigid conduit must bear the ETL Verified PVC-001 label to signify compliance to the adhesion performance standard.

C. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.

D. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.

E. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.

F. Form 8 Condulets, ½-inch through 2-inch diameters, shall have a tongue-in-groove gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 inches of mercury (vacuum) for 72 hours shall be available.

G. Form 8 Condulets shall be supplied with plastic encapsulated stainless-steel cover screws.

H. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.

I. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30°F (-1°C).

J. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.

K. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.

L. Independent certified test results shall be available to confirm coating adhesion under the following conditions
   1. Conduit and condulet exposure to 150°F (65°C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D1151)
   2. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
   3. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
   4. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.

M. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameter of the coated conduit. All U bolts shall be provided with plastic encapsulated nuts that cover the exposed portions of the threads.

N. All fittings, clamps, straps, struts, and hardware used with PVC coated conduit shall be PVC coated or 316 stainless steel

2.7 STEEL FLEXIBLE CONDUIT

A. Steel flexible metallic conduit:
   1. Zinc coated inside and out

2. 18-inches minimum length, 24-inches maximum length

B. Steel flexible metallic conduit for tap connections to light fixtures where steel MC Cable fixture whips are not used:
1. 18 inches minimum length; 6 feet maximum length

C. Liquid tight flexible steel conduit
1. Type L.A. - Grounded - UL Approved
2. 18-inches minimum length, 24-inches maximum length

2.8 PVC CONDUIT

A. UL labeled Schedule 40 and Schedule 80

B. PVC fittings and solvent welded joints

C. Acceptable PVC condulet manufacturer: Ipex, Cantex

2.9 CONDULETS AND CONDUIT BODIES

A. UL Labeled

B. Form 85

C. PVC Coated: Form 8

D. LBC Condulets shall be used for size 2 inch and above.

E. LL and LR Condulets shall not be used for 2 inch and above

2.10 ROOF MOUNTED CONDUIT AND BOX SUPPORTS

A. Conduit supports and pads suitable for direct sunlight, conduit size, weight, quantity and roof system with unistrut supports and accessories. Conduit supports shall allow for conduit expansion and contraction.

B. Refer to roofing specifications for additional information. The limitations and restrictions contained in any roofing specification shall prevail and supercede these specifications for roof mounted supports for conduits and boxes.

C. Approved Manufacturer:
1. Portable Pipe Hangers
2. Eaton B-Line
3. Miro Industries, Inc.

2.11 ALUMINUM CONDUIT

A. UL Labeled

B. Aluminum fittings shall meet the same requirements of aluminum conduits, compatible steel fittings.
1. UL Labeled for use with aluminum conduit.

2.12 STAINLESS STEEL CONDUIT

A. UL Labeled

B. Rigid Stainless Steel:
1. Type 304 Stainless Steel
2. Threaded ends
3. Insulated Bushings

C. EMT:
1. Type 304 Stainless Steel
2. Compression Fittings
3. Insulated Bushings

D. Fittings, elbows, nipples, strut, device box, clamps straps, etc.
1. Type 304 Stainless Steel

2.13 EXTERIOR IN-GRADE PULL BOXES

A. Enclosures, boxes and covers are required to conform to all test provisions of the most current American Association of State Highway and Transportation Officials (AASHTO) standards for H-20 loading applications.
1. AASHTO H-20 certified precast concrete, cast iron or other AASHTO recognized materials, rated for deliberate traffic.
2. Conduit entry knock-outs as required
3. Bolt down galvanized steel/cast iron covers
4. Thin wall knocks outs as required
4. Integral bottom
5. Box height as required for specified conduit depth and required top elevation.
6. Concrete design strength of minimum 5,500 PSI at 28-days
7. Place enclosures on a minimum of 6 inches of coarse gravel with a border of 6-inches beyond the enclosures exterior dimension.
8. Size and volume as required for application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical conduits and fittings for all wiring of any type unless specifically specified or instructed to do otherwise. Install conduits and fittings in accordance with local codes and applicable sections of the NECA “Standard of Installation”, concealed where possible.
1. Fasten conduit supports to building structure and surfaces; do not support to roof deck.
2. Arrange supports to prevent misalignment during wiring installation.
3. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
4. Do not attach conduit to ceiling support wires.
5. Arrange conduit to maintain head room and present neat appearance.
6. Maintain 4-inch clearance between conduit and rooftop surfaces.
7. Cut conduit square using saw or pipe cutter; de-burr cut ends.
8. Bring conduit to shoulder of fittings; fasten securely.
9. Conduit penetrations to all individual motor controllers, VFDs, and motor control cabinets shall only be made at the bottom of the enclosure. For other equipment, provide listed water sealing conduit hubs to fasten conduit to sides or tops of electrical equipment enclosures, device box, gutter, wireway, disconnect, etc.
10. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
11. Ground and bond conduit as required.
12. Identify conduit as required.
13. Route all conduits above building slab perpendicular or parallel to building lines.
14. Do not use no-thread couplings and connectors for galvanized steel, PVC coated galvanized steel, or aluminum rigid conduit.

B. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

C. In areas where raceway systems are exposed and acoustical or thermal insulating material is to be installed on walls, partitions, and ceilings, raceways shall be blocked out proper distance to allow insulating material to pass without cutting or fitting. Also provide Kindorf galvanized steel channels to serve as standoffs for panels, cabinets and gutters.

D. Securely fasten conduits, supports and boxes, to ceiling (not roof deck), walls, with Rawl Plugs or approved equal anchors. Use lead cinch anchors or pressed anchors. Use only cadmium plated or

galvanized bolts, screws. Plastic anchors and lead anchors shall not be used for overhead applications.

E. Provide separate raceway systems for each of the following when specified, indicated or required:
1. 120/208 volt circuits
2. 277/480 volt circuits
3. Emergency
   a. Life safety branch
   b. Critical branch
   c. Equipment branch
4. Voice/Data
5. Sound reinforcement
6. Theatrical and Architectural Dimming Controls
7. MATV/CATV
8. Security CCTV
9. Security System
10. Communications / PA Systems / Sound System Line Input and Speakers
11. Fire Alarm
12. Lighting Control Systems
13. Building Management Control Systems

F. Unless shown otherwise, do not install conduit in or below concrete building slabs.

G. Unless shown otherwise, do not install conduit horizontally in concrete slabs. If required and approved provide PVC coated RGC.

H. Roof penetrations shall be made in adequate time to allow the roofing installer to make proper flashing. Conduit for equipment mounted on roof curbs shall be routed through the roof curb. Conduit, gutters, pull boxes, junction boxes, etc. shall not be routed on roof unless specified otherwise. Where specifically indicated to be routed or mounted on the roof, supports shall be as specified, as recommended by roofing manufacturer and roof support manufacturer and as required by NEC. Place supports every five feet along conduit run and within 3 feet of all bends, condulets, and junction boxes. Provide roofing pad under stands at directed by Architect and as recommended by roofing manufacturer and roof support manufacturer. Provide additional unistrut supports and accessories as required.

I. PVC coated conduit shall have all nicks and cuts to the protective coating repaired using manufacturer’s approved touch-up material as recommended by manufacturer. Provide a minimum of two-wraps of 3M-50 type tape over touch-up.

J. Installation of the PVC Coated Conduit System shall be performed in accordance with the Manufacturer’s Installation Manual. To assure correct installation, the installer shall be certified by Manufacturer to install coated conduit. Submit copies of training certification with submittal. Contractor shall coordinate installation with manufacturer’s representative for field training and observation of installed PVC coated rigid galvanized conduit and fittings. Manufacturer’s representative shall certify the installation is in accordance with manufacturer’s installation instructions. Submit copies of installation certification prior to cover-up of underground installation.

K. All conduit terminations at locations including but not limited to, switchgear, pull boxes, outlet boxes, stub-up, and stub-outs:
1. Provide insulated throat connectors for EMT conduits.
2. Provide insulated bushing on all rigid conduit terminations.
3. Provide locknuts inside and outside of all boxes and enclosures.
4. Provide threaded type plastic bushing at all boxes and enclosures

L. In suspended ceilings, support conduit runs from the structure, not the ceiling system construction.
1. Do not support from structural bridging.
2. Do not support from metal roof deck.

M. Completely install each conduit run prior to pulling conductors. All boxes are to be accessible after completion of construction.

N. All conduits must be kept dry and free of water or debris with approved pipe plugs or caps. Cap or plug conduit ends prior to concrete pours.

O. Ream ends of conduits after cutting and application of cutting die to remove rough edges.

P. Install all above concrete slab conduits perpendicular or parallel to building lines in the most direct, neat and workmanlike manner.
1. Cable Tension:
   a. 0.008 lb./cmil for up to 3 conductors, not to exceed 10,000 pounds.
   b. 0.0064 lb./cmil for more than 3 conductors, not to exceed 10,000 pounds
   c. 1000 lbs. per basket grip.
2. Sidewall pressure: 500 lbs./ft.
3. Conduit runs within the following limits of bends and conduit length between pull points shall not exceed the above installation pulling tension and sidewall pressure limits.
   a. Three (3) equivalent 90-degree bends: not more than fifty feet (50') between pull points.
   b. Two (2) equivalent 90-degree bends: not more than one hundred feet (100') between pull points.
   c. One (1) equivalent 90-degree bend: not more than one hundred fifty feet (150') between pull points.
   d. Straight pull: not more than two hundred feet (200') between pull points.
4. Indicate sizes of conduits, wireway sections, and cable tray sections on the as-built drawings.
5. Hold horizontal and vertical conduits as close as possible to walls, ceilings and other elements of the building construction. Conduits shall be kept a minimum of 6 inches clear of roof deck / insulation, and 2 inches clear of above floor deck / insulation.
6. Install conduits to conserve building space and not obstruct equipment service space or interfere with use of space. Conduit shall not be routed on floors, paved areas or grade.
7. Where a piece of equipment is wired from a switch or box on adjacent wall, the wiring shall go up the wall from the box, across at or near the ceiling, and back down to the equipment. Wiring shall not block the walkway between wall and equipment.
8. Horizontal runs of conduit on exposed walls shall be kept to a minimum.
9. Conduit for mechanical / plumbing equipment installed outdoors shall be routed with the associated mechanical / plumbing pipe support rack system where practical, coordinate with Divisions 22 and 23.
10. Conduits installed in public areas, not concealed by architectural ceilings, shall be supported by galvanized steel channel racks to bottom of roof deck or floor deck. Conduits shall be grouped for neat workman-like appearance.

Q. Install expansion and deflection fittings and bonding jumpers on straight runs which exceed 200-feet, on center, and at 200-feet maximum, on center, on straight runs which exceed 400-feet, and where conduits cross building expansion joints.

R. Provide grounding bushings at concentric/eccentric knockouts or where reducing washers are used.

S. Run conduit to avoid proximity to heat producing equipment, piping surfaces with temperatures exceeding 104 degrees F., and flues, keeping a minimum of 13-inches clear.

T. Install conduit as a complete system, without conductors, continuous from outlet to outlet and from fitting to fitting. Make up threaded joints of conduit carefully in a manner to ensure a tight joint. Fasten the entire conduit system into position. A run of conduit between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of four quarter bends, including those bends located immediately at the outlet or fitting.

U. Conceal conduit systems in finished areas. Conduit may be exposed in mechanical and electrical rooms, and where otherwise shown or indicated only. Run the conduit parallel and perpendicular to the structural features of the building and support with malleable iron conduit clamps at intervals as required by NEC or on conduit racks, neatly racked and bent in a smooth radius at corners.

V. Conduit bends shall be factory elbows or shall be bent using equipment specifically designed to

bend conduit of the type used to maintain the conduit's UL listing. Conduit hanger spacing shall be 10 feet or less and as required by the NEC for all conduit. Beam clamp attachments to steel joist chords is prohibited. Beam clamps may only be used at beams, no exceptions. Connections to joists shall be made with galvanized channel extended between joist chords or with galvanized channel bearing on the vertical legs of joist chord angles.

W. Support conduit on galvanized channel, using compatible galvanized fittings (bolts, beam clamps, and similar items), and galvanized threaded rod pendants at each end of channel and secure raceway to channel and channel to structure. Where rod pendants are not used, channel supports are to be secured to structure at each end. Conduit supports are to be secured to structure using washers, lock washers, nuts and bolts or rod pendants; use of toggle bolt "wings" are not acceptable. Support single conduit runs using a properly sized galvanized conduit hanger with galvanized closure bolt and nut and threaded rod. Raceway support system materials shall be galvanized and manufactured by Kindorf, Unistrut, Superstrut, Caddy, or Spring Steel Fasteners, Inc. Provide chrome or nickel-plated escutcheon plates on conduit passing through walls and ceilings in finished areas. Do not support conduit from other conduit, structural bridging or fire rated ceiling system. Do not support more than one conduit from a single all-thread rod support. Provide electrical insulating sleeve or wrapping for aluminum conduit supported by zinc coated supports or fasteners. Channel supports shall have cut ends filed smooth. When installed outside of the building, or in areas subject to moisture, the cut ends shall be painted with ZRC galvanized paint or equivalent.

X. Terminate all motor connection conduits in mechanical room spaces with a floor pedestal and with "Tee" conduit at motor outlet height for flexible conduit.

Y. Where conduit is not embedded in concrete or masonry, conduit shall be firmly secured by approved clamps, half-straps or hangers. Tie wire and short pieces of conduit used as supports and or hangers are not approved.

Z. Where "LB" condulets are used, 2-inches and larger shall be type "LBD".

AA. No more than 12 conduits containing branch circuits may be installed in junction boxes, pull boxes or gutters.

BB. Flexible metal conduit and liquid tight flexible metal conduit shall only be used for final connections from junction box to equipment, light fixtures, power poles, etc. They are not to be used in lieu of conduit runs. They shall not be used for wall or roof penetrations unless they are installed in a PVC coated RGC conduit sleeve at least one size larger than the OD of the flexible conduit.

CC. Where 3-1/2-inch conduit is specified and the required or specified material is Schedule 80 PVC, provide 4-inch conduit.

DD. "Daisy Chaining" light fixtures installed for lay-in ceiling areas is not allowed. Each light fixture shall have its own fixture whip from junction box. The only exception being light fixtures installed end to end using chase nipples between them, or light fixtures recessed in non-accessible ceilings.

EE. In above ceiling applications, do not install raceways, junction boxes, gutters, disconnects, etc. within 36 inches directly in front of HVAC control boxes or other equipment requiring access from a point starting from the top of control box / equipment down to ceiling.

FF. Do not install conduit, junction boxes, etc. within 18 inches of outside edges of roof access openings.

GG. Install minimum size 2-inch nipple, at least one, between multi-sectional panels for branch circuit independent of feeder conductors.

3.2 CONDUITS

A. Conduit above grade indoors:
   1. Concealed Conduits: EMT with set screw fittings
   2. Exposed conduits:

a. Below nine feet AFF where not directly attached and against building walls, ceiling, or structure: Rigid metal conduit or x-wall RTRC.
b. Where subject to physical damage: Rigid metal conduit or x-wall RTRC.
c. Wet locations: PVC coated galvanized rigid steel or aluminum conduit
d. Damp Locations: Aluminum rigid conduit or x-wall RTRC.
e. Exposed conduits in mechanical rooms or electrical rooms shall be rigid galvanized steel or x-wall RTRC when installed below 18-inches above finished floor.

B. Conduit installed above grade outdoors:
1. Galvanized rigid steel or x-wall RTRC for conduits up utility poles and where subject to physical damage or where located less than four feet above finished floor.
2. Aluminum or x-wall RTRC where not subject to physical damage and where located four feet above finished floor.

C. Conduit where indicated underground:
1. PVC Coated Galvanized rigid steel or RTRC conduit elbows and Schedule 80 PVC, RTRC, or PVC coated galvanized steel straight run conduits. PVC conduits for underground branch circuits shall be Schedule 80 or Schedule 40 PVC.
a. PVC conduit and fittings shall be used only for straight horizontal runs and for vertical risers at site lighting pole bases. Bending straight sections of PVC conduit to less than 25-foot radius or the use of PVC factory bends is not allowed.
b. Change in direction of conduit runs, either vertical or horizontal, shall be with RTRC or PVC coated galvanized steel elbows or long sweep bends of straight PVC conduit sections. Long sweep bends of straight PVC 20-foot sections shall have a minimum radius of curvature of 25 feet and a maximum arc of 22.5degrees. Multiple long sweep bends of straight PVC sections shall be separated by a minimum of 20-feet of straight, linear, PVC sections.
c. Provide RTRC or PVC coated rigid galvanized steel conduit elbows and fittings with urethane interior coating at all changes in direction with radius of less than 25-feet and at all vertical runs to 18 inches above finished floor elevation. For interior slab penetrations, provide continuous RTRC or PVC coated rigid galvanized steel conduit and fittings with urethane interior coating from change in direction to 18 inches above finished floor elevation, except where stubbed-up under and inside equipment or switchgear where conduit shall be terminated at minimum two inches above concrete housekeeping pad.
d. Elbows for underground electrical service entrance, feeders, transformer primary / secondary, telecommunication, and low voltage conduits shall be RTRC or PVC coated rigid galvanized steel with long radius as follows:
1) Up to 1-inch conduit, minimum 12-inch radius.
2) 1.5-inch conduit, minimum 18-inch radius.
3) 2-inch conduit, minimum 24-inch radius.
4) 2.5-inch conduit, minimum 30-inch radius.
5) 3-inch conduit, minimum 36-inch radius.
6) 3.5 to 6-inch conduit, minimum 48-inch radius.
e. Conduit for all floor boxes shall be routed below building slab from floor box to nearest column, wall, or as indicated.
f. Conduits shall not be routed horizontally in building slab, grade beams or pavement.
2. Encase all underground conduits in concrete.
a. Concrete shall be tinted red throughout with a ratio of 10 pounds of dye per yard of concrete unless prohibited by utility for utility conduits. Concrete encasement for utility installed conductors shall be as specified by the utility and comply with their standards and specifications. Where utility does not require but allows concrete encasement of conduits, provide concrete encasement as specified herein.
b. Provide minimum 3-inch concrete encasement around conduits.
c. Provide conduit spacers for parallel branch/feeder conduits.
d. Use suitable manufactured separators and chairs installed 4 feet on centers. Securely anchor conduit at each chair to prevent movement during backfill placement.

3. Install building voice / data / video / communications main service conduits and electrical service transformer primary and secondary conduits with top of concrete encasement minimum 48-inches below finished grade or pavement. Voice / data / video / communications conduits and electrical service primary conduits for utility owned electrical service transformers shall also comply with the respective utility company requirements and standards. All other underground conduits outside of building other than voice / data / video / communications main service conduits and electrical service transformer primary and secondary conduits shall have top of concrete encasement at 36 inches minimum below finished grade or pavement.
4. Provide two “caution” plastic tapes at 6-inches and 18-inches below finished slab, grade, or pavement; identify as specified in Section 26 05 00.
5. Conduits located outside building, provide magnetic locator tape at top of first compacted layer of backfill or concrete.
6. During construction, partially completed underground conduits shall be protected from the entrance of debris such as mud, sand, and dirt by means of conduit plugs. As each section of the underground conduit is completed, a testing mandrel with diameter ¼-inch smaller than the conduit, shall be drawn through each conduit. A brush with stiff bristles shall be drawn through until conduit is clear of particles of earth, sand, or gravel. Conduit plugs shall then be installed.
7. Utility underground conduit for Utility Company cable shall be installed per Utility Company standards, and their specifications for this project.
8. Concrete shall be Portland Cement conforming to ASTM-C-150, Type 1, Type III or Type V if specified. Cement content shall be sufficient to product minimum strength of 2,500 PSI.
9. Contractor shall stake out routing and location of underground conduits using actual field measurements. He shall obtain approval of the Owner and Architect before beginning trenching, horizontal drilling, and excavation.
10. Verify location and routing of all new and existing underground utilities with the Owner and Architect on the job site. Stake out these existing utilities so that they will not be damaged. Stake out new utilities to provide coordination with other trades and with new and existing utilities, easements, property lines, restricted land use areas, and right-of-ways. Verify existing public utilities with Call811.

D. Conduit shown in concrete walls, floor or roof slab:
   1. PVC Coated Galvanized Rigid steel.

E. Conduits that penetrate concrete slab, or within 100 feet of cooling towers, or at designated corrosive locations.
   1. RTRC
   2. PVC coated galvanized rigid steel

F. Connections to equipment mounted on roof, rotating equipment, transformers, and kitchen or food processing equipment, or where flexible conduit is required outdoors.
   1. Liquid tight flexible metal conduit (1/2 inch may be used for roof top supply / exhaust fans only)
   2. Liquid tight flexible metal conduit for 24-inch maximum length
   3. Conduit for roof-mounted equipment shall be routed inside the roof curb assembly roof opening. Provide permanent lock-off device at panelboard circuit breakers serving roof equipment and accessories to enable tag-out procedures for all power routed through roof curb and to the roof mounted equipment and accessories.

G. Light fixture whips:
   1. Accessible ceilings and open structure: ½-inch flexible steel conduit or steel MC cable, length not to exceed 6-feet.
   2. Non-accessible ceilings: ½-inch flexible steel conduit. Length as required to make a tap at an accessible j-box. Recessed light fixtures in non-accessible ceilings may be daisy chained using the light fixture’s integral, UL listed j-box or internal wire way that is accessible through fixture from below the ceiling.
   3. Dedicated insulated ground wire.
   4. Light fixture whips shall not rest on ceiling grid or tile.
   5. Light fixture whips shall not be supported from the ceiling suspension system. Support

from the structure with #13 AWG galvanized iron wire pendants and Caddy clips. Do not support conduit from structural bridging. Flexible conduit and steel MC cable shall be kept a minimum of 2 inches clear of roof deck.

H. Conduits at Natatorium or therapeutic pool areas:
1. Underground conduit shall be as specified in this section.
2. Exterior conduits and boxes within 100 feet of exhaust openings shall be x-wall RTRC or PVC coated galvanized rigid steel or stainless steel.
3. Exposed conduits in chemical storage rooms, pool mechanical equipment (pump rooms, and pool equipment storage rooms shall be Schedule 80 PVC. Boxes shall be PVC, or 304 Stainless Steel.
4. Exposed conduits and boxes in indoor pool areas and all other indoor public areas shall be Type 304 Stainless Steel.

I. Conduits located inside greenhouses and natatorium pump and water treatment rooms:
1. X-wall RTRC
2. Schedule 80 PVC
3. PVC coated galvanized rigid steel conduit and fittings.

J. Conduits in classified hazardous (Classified) locations:
1. Conduit fittings and seals UL listed for the classification

3.3 CONDUIT PENETRATIONS, SLEEVES AND ESCUTCHEONS

A. Furnish sleeves for placing in construction for all conduit passing through concrete or masonry walls, partitions, beams, all floors other than grade level, and roofs. A conduit sleeve shall be one size larger than the size of conduit, which it serves except where larger sizes are required for manufactured water, fire, or smoke stop fittings.
1. Sleeves set in concrete floor construction shall be minimum Schedule 40 galvanized steel.
2. Sleeves shall extend 3-inches above the finished floor.

B. Sleeves in concrete or masonry walls shall be RTRC or Schedule 40 galvanized steel. Sleeves shall be set flush with finished wall.

C. Install manufactured UL listed water, fire, and smoke stop fittings, or caulk around conduit or cables in sleeves with sufficient UL listed fire safe insulation or foam to maintain wall or floor slab fire or smoke rating. Refer to Architecture drawings for locations of rated walls.

D. Provide Linkseal Mechanical Seals around conduit penetrations through walls below grade. Provide a pull box to install a water stop inside wall penetration. Internally seal low voltage cabling conduit penetrations with waterproof caulking.

E. Sleeves penetrating walls below grade shall be Schedule 40 black steel pipe with ¼-inch thick steel plate secured to the pipe with continuous fillet weld. The plate shall be located in the middle of the wall and shall be 2-inches wider all around than the sleeve that it encircles. The sleeve should extend a minimum of 24-inches on either side of the penetration. The entire assembly shall be hot-dipped galvanized after fabrication. Do not sleeve or penetrate grade beams.

F. Conduit passing through the housing on connected equipment shall pass through a cleanly cut hole protected with a threaded steel bushing. Route conduit through roof openings, for piping and ductwork or through suitable roof jack, with pitch pocket. Coordinate location with roofing installation as required.

G. Conduit passing through fire rated wall shall be sealed with Fire Stop. Route conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Division 7.

3.4 POWER DISTRIBUTION UNDERGROUND FEEDER CONDUIT AND UNDERGROUND SERVICE ENTRANCE CONDUIT

A. Power underground feeder and service entrance shall be of individual conduit encased in concrete. Unless shown otherwise, the type of conduit used shall not be mixed in any one underground

conduit and shall be the size indicated on the drawings. The concrete encasement surrounding the underground conduit shall be rectangular in cross-section, having a minimum concrete thickness of 3-inches, except that conduit for 120V and above shall be separated from control and signal conduits by a minimum concrete thickness of 3-inches. Encasement concrete shall be tinted in red.

B. During construction, partially completed underground conduits shall be protected from the entrance of debris such as mud, sand, and dirt by means of conduit plugs. As each section of the underground conduit is completed, a testing mandrel shall be drawn through until each conduit is clear of particles of earth, sand, or gravel. Conduit plugs shall then be installed.

C. Furnish the exact dimensions and location of power underground conduit to be encased in time to prevent delay in the concrete work.

D. Conduit for service entrance underground conduits shall be as indicated on the drawings.

E. Primary power underground conduit shall be installed in accordance with utility company standards and the utility company specifications for this project.

3.5 TELECOMMUNICATIONS, LOW VOLTAGE AND EMPTY CONDUIT SYSTEM RACEWAYS

A. Conduit shall be installed in accordance with the specified requirements for conduit and with the additional requirements that no length of run shall exceed 100-feet for 1 inch or smaller trade sizes and shall not contain more than two 90-degree bends or the equivalent. Pull or junction boxes shall be installed to comply with these requirements. Provide plastic bushings at all conduit terminations. Provide a grounding bushing on each data and voice conduit.

B. Conduits shall be installed from outlet box to above an accessible ceiling. All cables routed through open spaces (no-ceiling below roof deck or above floor deck) shall be routed in conduit. Telecommunications systems, CATV, CCTV, fire alarm and BMCS cables can be installed above accessible ceilings without conduit. Cables installed above accessible ceiling shall be plenum rated. Conduit rough in of these cables shall include a 90-degree turn-out to an accessible location with insulated bushings on the end of the conduit.
   1. Provide conduit from each telecommunications outlet box to accessible ceiling plenum.
   2. Provide conduit from each security / surveillance device outlet box to accessible ceiling plenum.
   3. Provide two conduits for each multi-media outlet box and each outlet box indicated to contain more than four data, audio, or video drops to accessible ceiling plenum.
   4. Provide the following minimum conduits for telecommunications and multi-media wall, floor, and ceiling mounted outlet boxes. Use the largest diameter conduit indicated below unless instructed otherwise in writing from the Architect:
      a. Non-masonry outlet box: Two 1-inch conduits.
      b. Masonry outlet box: Two 1-inch conduits, or three 3/4-inch conduits.
      c. Where indicated differently on plans or where conflicts arise, notify the Architect / Engineer prior to installation.

C. All conduit in which cable is to be installed by others shall have pull string installed. The nylon pull string shall have not less than 200 lb. tensile strength. Not less than 12-inches of slack shall be left at each end. Provide blank cover plate before substantial completion if box is for a future installation after substantial completion of the project. Conduit shall extend to a minimum six inches above nearest accessible ceiling and be turned horizontally with plastic bushing at terminations.

D. Conduits for Building Entrance Facilities:
   1. Underground Outside Plant: Install a pull box every 300-feet or after 180 degree turns.
   2. Inside Plant: Install a pull box every 150-feet or after 180 degree turns. All turns shall be large sweeps, not sharp 90s, with the radius of the sweep at least 10X the diameter of the conduit. Hence, a 4-inch conduit requires a 40-inch minimum radial sweep. If field conditions absolutely mandate a sharp 90-degree bend to be installed, then a pull box shall be installed at that location regardless of distance.
   3. Building entrance facilities shall not terminate in an IDF or any other space except the MDF.
   4. Coordinate the termination location of the building entrance facilities in the MDF with the

room layout and equipment configuration.

5. Provide 4-inch conduit unless indicated otherwise. Provide (3) fabric innerducts in each 4-inch conduit.

3.6 EXTERIOR IN-GRADE PULL BOXES

A. Provide pull boxes where specified and as required.

B. Pull boxes located in pavement shall be set with proper extensions so that top of cover is flush with pavement.

C. Pull boxes located in non-paved areas shall be set two-inches above surrounding finished grade. Provide 12-inch wide by 8-inch deep reinforced concrete crown around neck or opening and sloped down away from pull box opening.

3.8 IDENTIFICATION

A. Conduit Systems: Provide adequate marking of conduit larger than one inch exposed or concealed in interior accessible spaces to distinguish each run as either a power (120/208V or 277/480V) or signal / telecommunication conduit (Fire Alarm, BAS, BMCS, Security, CCTV, Access Control, Intrusion Detection, Telecom, etc.). Except as otherwise indicated, use orange banding with black lettering. Provide self-adhesive or snap-on type plastic markers. Locate markers at ends of conduit runs, near switches and other control devices, near items of equipment served by the conductors, at points where conduit passes through walls or floors or enters non-accessible construction, and at spacing of not more than 50-feet along each run of exposed conduit. Switch-leg conduit and short branches for power connections need not be marked, except where conduit is larger than 1-inch.

END OF SECTION

SECTION 26 05 35

ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical connections as required and scheduled, and as specified.

1.2 RELATED WORK

A. Refer to other Divisions for specific individual equipment electrical requirements.

1.3 QUALITY ASSURANCE

A. UL Label: Products shall be UL listed to the extent possible.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. General: For each electrical connection indicated, provide a complete assembly including, but not limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories needed to complete splices and terminations.

B. Raceways: Refer to related sections.

C. Conductors and Connectors: Refer to related section. Conductors at equipment terminations shall be copper.

D. Terminals: Provide electrical terminals as indicated by the terminal manufacturer for the application.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS

A. General: Install electrical connections as shown, in accordance with applicable portions of the NECA Standard of Installation, and industry practices.

B. Conductors: Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Where possible, match conductors of the electrical connection for interface between the electrical supply and the installed equipment.

C. Splice Insulation: Cover splices with electrical insulation equivalent to, or of a higher rating than, insulation on the conductors being spliced.

D. Appearance: Prepare conductors by cutting and stripping covering, jacket, and insulation to ensure a uniform and neat appearance where cables and wires are terminated.

E. Routing: Trim cables and wires to be as short as practical. Arrange routing to facilitate inspection, testing, and maintenance.

F. Motor Connections: Where possible, terminate conduit in conduit boxes at motors. Where motors are not provided with conduit boxes, terminate the conduit in a suitable condulet, and make motor connections. Conduit passing through the housing on connected equipment shall pass through a cleanly cut hole protected with an approved grommet. For all AHU or fan motors and all other motors 10 HP and larger, at the motor connection do not use wire nuts. Provide copper alloy split bolt connectors or compression lugs and bolts. Insulate connection with Scotch Super 88 vinyl electrical tape over rubber tape, or Tyco Gelcap Motor Connection Kit.

G. Conduit connections to equipment including, but not limited to, Variable Frequency Drives, Manual and Automatic Transfer Switches, Surge Suppression Devices, motor controllers, electrical disconnects, food service / processing equipment, electronics, control panels and Owner furnished equipment:
   1. Make conduit penetrations only at the bottom flat surface of the equipment and only where permitted by the equipment manufacturer to avoid un-intentional water entry. Coordinate installation of electrical connections for equipment with equipment installation work. Where equipment manufacture does not permit a bottom conduit entry, verify with Owner/Engineer and locate the conduit entry at the side surface as close as possible to the bottom of the enclosure.
   2. Where conduit originates from an elevation above the conduit entry, provide a “T” condulet below the enclosure’s bottom elevation. Provide conduit from the condulet up to the enclosure bottom horizontal surface for electrical connection.

H. Identification: Refer to Electrical General Provisions for identification of electrical power supply conductor terminations with markers approved as to type, color, letter and marker size by the Architect. Fasten markers at each termination point, as close as possible to each connecting point.

I. Equipment and Furnishings: Refer to other Divisions. Coordinate power and control provisions shown for equipment and furnishings with the provisions required for the furnished equipment and furnishings. Where the power and control requirements are less than or equal to those specified, modifications to power and control provisions shall be made at no cost as a part of coordination. Where power and control requirements are in excess of those shown, notify the Architect in writing of the requirements.

END OF SECTION

SECTION 26 05 37

ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide electrical box and fitting work as required, scheduled, indicated, and specified.

1.2 QUALITY ASSURANCE

A. UL Label: Electrical boxes and fittings shall be UL listed.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS

A. Interior Outlet Boxes: Provide galvanized steel interior outlet wiring boxes, of the type, shape, and size, including depth of box, to suit respective locations and installation. Construct with stamped knockouts in back and sides. Provide gang boxes where devices are shown grouped. Single box design; sectional boxes are not acceptable, except for wall mounted electronic displays.
   1. Type of Various Locations:
      a. Wall mounted interactive media boards, video displays, televisions, electronic signage and similar installations; recessed wall mounted box for power and/or multi-media (low voltage) outlets: Arlington Industries #TVBS 613, 4-gang steel box with white trim plate.
      b. Technology, data, voice, video and multi-media outlet boxes at locations other than wall mounted interactive media boards, video displays, televisions, electronic signage and similar installations: minimum 4-inch square (2-gang), 3-inch deep interior outlet boxes. Raco #260H large capacity box with ½ through 2-inch knockouts.
      c. Security, access control, and video surveillance outlet boxes: single gang, 3-inch deep outlet boxes mounted long axis vertically.
      d. All other applications: minimum 4-inch square (2-gang) 2-1/8-inch deep boxes.
      e. Masonry Walls: Galvanized switch boxes made especially for masonry installations; depths of boxes must be coordinated for each installation.
      f. Surface: Type FS or FD box with surface cover.
      g. Corrosive locations or natatorium areas: 316 stainless steel construction suitable for the installation.
      h. Hazardous (Classified) Locations: Explosion proof boxes, seals and fittings.
      i. Special: Where above types are not suitable, boxes as required, taking into account space available, appearance, and Code requirements
   2. Interior Outlet Box Accessories: Outlet box accessories required as for installation, including covers or wall device plates, mounting brackets, wallboard hangers, extension rings, plaster rings for boxes in plaster construction, fixture studs, cable clamps and metal straps for supporting outlet boxes. Accessories shall be compatible with outlet boxes used and meet requirements of individual wiring.

B. Damp Location Outlet and Damp or Wet Location Switch Boxes: Deep type, hot dipped galvanized cast-metal weatherproof outlet wiring boxes, of type, shape, and size required. Include depth of box, threaded conduit ends, and stainless steel cover plate with spring-hinged waterproof caps suitable for application. Include faceplate gasket and corrosion-resistant, tamper / vandal proof fasteners.

C. Wet Location Outlet Boxes: Hot dipped galvanized cast-iron weatherproof outlet wiring boxes, of type, shape, and size required. Include depth of box, threaded conduit ends.

D. Junction and Pull Boxes: Galvanized sheet steel junction and pull boxes, with screw-on covers, of type, shape, and size, to suit respective location and installation.
   1. Type for Various Locations:
      a. Minimum Size: 4-inch square, 2-1/8-inches deep.

b. 150 Cubic Inches in Volume or Larger: Code gauge steel with sides formed and welded, screw covers unless shown or required to have hinged doors. All boxes mounted above ceiling shall have screw covers. Boxes in all other areas with covers larger than 12-inches shall have hinged with screw covers. Knockouts factory stamped or formed in field with a cutting tool to provide a clean symmetrically cut hole.
c. Exterior or Wet Areas: 304 stainless steel NEMA 4X construction with gaskets and corrosion-resistant fasteners

E. Conduit Bodies: Provide galvanized cast-metal conduit bodies, of type, shape, and size, to suit location and installation. Construct with threaded conduit ends, removable cover, and corrosion-resistant screws.

F. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts, and insulated conduit bushings of type and size to suit use and installation.

G. Outlet boxes in fire rated walls: Provide 2-hour rated gasket within box and below cover, equal to Rectorseal Metacaulk box guard and cover guard.

PART 3 - EXECUTION

3.1 INSTALLATION OF BOXES AND FITTINGS

A. Install electrical boxes and fittings as shown and as required, in compliance with NEC requirements, in accordance with the manufacturer's written instructions, in accordance with industry practices.

B. Provide recessed device boxes for wall mounted interactive media boards, video displays, televisions, electronic signage and similar installations.

C. Provide minimum 4-inch square (2-gang), 3-inch deep interior outlet boxes for technology, data, voice, video, and multi-media outlet boxes at locations other than wall mounted interactive boards, video or visual displays. Provide single gang only, 3-inch deep outlet boxes mounted long axis vertically for security, access control, and video surveillance, coordinate with security equipment installation. Provide minimum 4-inch square (2-gang) 2-1/8-inch deep boxes for all other applications. Where indicated differently on plans or where conflicts arise, notify the Architect / Engineer prior to installation. Box extenders or plaster rings shall not be used to increase size. Provide increased box size as required.

D. Junction and pull boxes, condulets, gutters, located above grid ceilings shall be mounted within 18-inches of ceiling grid. Junction and pull boxes above grid ceilings shall be mounted in the same room served. Junction boxes and pull boxes required for areas with inaccessible ceilings shall be located above the nearest accessible ceiling area. All junction box or pull box openings shall be side or bottom accessible. Removal of light fixtures, mechanical equipment or other devices shall not be required to access boxes. Outlet boxes above ceiling for low voltage terminations shall face towards the floor.

E. Use outlet and switch boxes for junctions on concealed conduit systems except in utility areas where exposed junction or pull boxes can be used.

F. Determine from the drawings and by measurement the location of each outlet. Locate electrical boxes to accommodate millwork, fixtures, marker boards, and other room equipment at no additional cost to the Owner. The outlet locations shall be modified from those shown to accommodate changes in door swing or to clear interferences that arise from construction as well as modifying them to center in rooms. The modifications shall be made with no cost as part of coordination. Check the conditions throughout the job and notify the Architect of discrepancies. Verify modifications before proceeding with installation. Set wall boxes in advance of wall construction, blocked in place and secured. Set all wall boxes flush with the finish and install extension rings as required extending boxes to the finished surfaces of special furring or wall finishes. Provide wall box support legs attached to stud to prevent movement of box in wall.

G. Unless noted or directed otherwise at installation, place outlet boxes as indicated on architectural elevations and as required by local codes.

H. Outlets above counters, mount long axis horizontally. Refer to architectural elevations and coordinate to clear backsplash and millwork.

I. Provide pull boxes, junction boxes, wiring troughs, and cabinets where necessary for installation of electrical systems. Surface mounted boxes below 9 feet and accessible to the public shall not have stamped knockouts.

J. Provide weatherproof boxes for interior and exterior locations exposed to weather or moisture.

K. Provide knockout closures to cap unused knockout holes in boxes.

L. Locate boxes and conduit bodies to ensure access to electrical wiring. Provide minimum 12-inch clearance in front of box or conduit body access.

M. Secure boxes to the substrate where they are mounted, or embed boxes in concrete or masonry.

N. Boxes for any conduit system shall not be secured to the ceiling system, HVAC ductwork or piping system.

O. Provide junction and pull boxes for feeders and branch circuits where shown and where required by NEC, regardless of whether or not boxes are shown.

P. Coordinate locations of boxes in fire rated partitions and slabs to not affect the fire rating of the partition or slab. Notify the Architect in writing where modification or construction is required to maintain the partition or slab fire rating.

Q. Exterior boxes installed within 50-feet of cooling towers or water treatment areas shall be of 304 stainless steel, weatherproof NEMA 4X construction.

R. Identification: Paint the exterior and cover plates of building interior junction boxes and pull boxes located above accessible ceilings or non-finished areas to correspond to the following colors:
1. Green: - 480/277 VAC systems
2. Blue: - 240 VAC three phase delta systems.
3. Red – All Emergency circuits, regardless of voltage, and fire alarm system.
4. Blue - 120/208 VAC 3 phase and 120/240 VAC single-phase systems
5. Verify with Division 23– Building Management and Control System - BMCS
6. Verify with Division 28 - Security and Surveillance equipment circuits

S. All box covers shall be labeled with Panel ID and circuit numbers of all circuits available in box using permanent black marker. Boxes containing main feeders are to list where fed from and load (example “MSB to Panel HA”). Information listed is to be legible, markovers are not acceptable. Multi-sectional panel numbers are not to be listed on covers (example “LA2” referring to Panel LA sec. 2 is to be listed as “LA”). Label covers for special applications explaining contents (example “Emerg. Gen. Annunciator controls”, “IDF ground”). Do not attach box covers that have both sides painted or labeled differently. In public areas where boxes are painted same color as room per architect, label inside covers. Boxes that are not used shall be labeled as not used and include panel ID. Example “Not Used Panel LA”. Unused raceways not in sight of panel shall be terminated in a box and labeled not used and include panel identification.

T. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

U. Use flush mounting outlet box in finished areas unless specifically indicated as being used with exposed conduit.

V. Locate flush-mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

W. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches with stud separation. Provide minimum 24 inches with separation in acoustic rated walls.

X. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Provide UL listed materials to support boxes in walls to prevent movement. Ensure box cannot be pushed inside wall.

Y. Use stamped steel bridges to fasten flush mounting outlet box between studs.

Z. Install flush mounting box without damaging vapor barriers, wall insulation or reducing its effectiveness.

AA. Use adjustable steel channel fasteners for hung ceiling outlet box.

BB. Do not fasten boxes to ceiling support wires.

CC. Support systems are to hang vertically straight down. All-thread supports, when used, are not to be installed at an angle or bent.

DD. Use gang box where more than one device is mounted together. Do not use sectional box.

EE. Use gang box with plaster ring for single device outlets.

FF. Support outlets flush with suspended ceilings to the building structure.

GG. Mount boxes to the building structure with supporting facilities independent of the conduits or raceways.

HH. Where multiple feeders are in one pull box, conductors shall be wrapped with 3M No. 7700 Arc and fireproof tape.

II. Provide plaster rings of suitable depth on all outlet boxes. Face of plaster ring shall be within 1/8 inch from finished surface.

JJ. Equip boxes supporting fixtures designed to accept fixture studs with 3/8-inch stud (galvanized malleable iron) inserted through back of box and secured by locknut. Boxes not equipped with outlets shall have level metal covers with rust-resisting screws.

KK. Do not mount junction boxes above inaccessible ceilings or in inaccessible spaces. Do not mount junction boxes above ceilings accessible only by removing light fixture, mechanical equipment or other devices. At inaccessible spaces use junction box furnished with light fixture or light fixture wiring compartment UL listed for through wiring.

LL. No more than 12 conduits containing branch circuits may be installed in any junction or pull box.

MM. All junction boxes shall be protected from building finish painters' over spray and from fire proofing overspray. Remove protective coverings when painting and fire proofing are complete.

NN. Bond equipment grounding conductor to all junction and pull boxes.

OO. Do not mount boxes or conduit bodies on walls directly above electrical panels or switchgear located next to walls.

PP. Do not mount boxes or conduit bodies within 18 inches of outside edges of roof access openings.

QQ. Box extenders or plaster rings shall not be used to increase the Code mandated cable capacity of a box. Provide proper size box.

3.2 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

END OF SECTION

SECTION 26 05 40

ELECTRICAL GUTTERS AND WIREWAYS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide electrical gutter work as shown, as specified and as required.

B. Application: The types of electrical gutters required for the project include the following:
1. Electrical wiring gutters
2. Voice / Data / Video / Communication and signal distribution wireway

1.2 QUALITY ASSURANCE

A. UL Label: Gutters and wireways shall be UL labeled.

PART 2 - PRODUCTS

2.1 ELECTRICAL GUTTERS AND WIREWAYS

A. General: Provide hinged electrical gutters and wireways in the types and sizes indicated or required, minimum 16 gauge thickness, with rounded edges and smooth surfaces; constructed in compliance with applicable standards; with features required.

B. Size: Provide size indicated. Where size is not indicated, construct in accordance with the NEC and other standards. Gutters shall be of manufacturer’s standard lengths, without field cutting or field extensions.

C. Accessories: Provide gutter and wireway accessories where indicated, constructed of same metal and finish as gutters or wireways.

D. Supports: Provide gutter and wireway supports indicated, conforming to NEC, and as recommended by the manufacturer, and as specified in Section 26 05 33 Conduit Systems.

E. Materials and Finishes: NEMA 1 gutters and wireways shall have gray powder coat finish over galvanized steel. Gutters and wireways installed outside shall be NEMA 3RX minimum. Gutters or wireways installed within 100-feet of cooling towers, at kitchen or food preparation areas, and natatorium, spa or therapy pool areas shall be of 304 stainless steel NEMA 4X construction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide gutters and wireways only where specified or required. Use of gutters and wireways shall be kept to a minimum.

B. Finishing: Remove burrs and sharp edges of gutters and wireways wherever they could be injurious to conductor insulation or jacket.

C. Installation: Install gutters and wireways where shown or required, in accordance with the manufacturer's written instructions, NEC, NECA "Standard of Installation," and with recognized industry practices to ensure that the gutters and wireways comply with the specified requirements. Comply with requirements of NEMA and the NEC pertaining to installation of electrical gutters.

D. Grounding: Electrically ground gutters and wireways to ensure continuous electrical conductivity. Provide equipment grounding conductor.

E. Conductors:
1. Complete gutter and wireway installation before starting the installation of conductors.
2. Provide sufficient space to permit access for installing, splicing, and maintaining the

conductors.

F. A maximum of 12 conduits containing branch circuits shall be allowed to be installed in any gutter or wireway.

END OF SECTION

SECTION 26 05 50

FIRESTOPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide firestop as required, and as specified. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

B. Types: Firestop required for the project includes smokestop.

1.2 QUALITY ASSURANCE

A. UL Label: Firestops shall be UL labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Nelson

B. 3M (Minnesota Mining Manufacturing)

C. Hilti

D. Specified Technologies, Inc.

E. Metacaulk

2.2 MATERIAL AND COMPONENTS

A. General: Except as otherwise indicated, provide firestop manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by the manufacturer, and as required for installation.

2.3 FIRESTOP

A. Conduits: Provide a soft, permanently flexible sealant for 1-1/2 to 2 hour rated fireproofing for steel conduits (up to 4" diameter).

B. Low Voltage Cables, Fiber Optic Cable and Innerduct: Provide Specified Technologies, Inc. EZ-Path single, double, or triple pathways as required.

PART 3 - EXECUTION

3.1 INSTALLATION OF FIRESTOPS

A. General: Install firestops in accordance with the manufacturer's installation instructions and industry practices to ensure that the firestops comply with requirements. Comply with UL and NFPA standards for the installation of firestops.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish and install items for identification of electrical products installed under Division 26.

1.2 SUBMITTALS

A. Submit product data

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. W.H. Brady Co.

B. Carlton Industries, Inc.

C. Seton Nameplate Co.

2.2 MATERIALS

A. Nameplates: Provide engraved three-layer laminated plastic nameplates with white letters on a black background.

B. Wire and Cable Markers: Provide vinyl markers with split sleeve or tubing type, except n manholes provide stainless steel with plastic ties.

C. Underground Warning Tape
1. Manufactured polyethylene material and unaffected by acids and alkalis.
2. 3.5 mils thick and 6 inches wide.
3. Tensile strength of 1,750 psi lengthwise.
4. Printing on tape shall include an identification note BURIED ELECTRIC LINE, and a caution note CAUTION. Repeat identification and caution notes over full length of tape. Provide with black letters on a red background conforming to APWA recommendations.

D. Panelboard Directories: Provide a typed circuit directory for each panelboard. Mount circuit directory in a permanent, clear lexan card holder locate don inside of door on panelboard.

E. Conduit Markers: Flexible vinyl film with pressure sensitive adhesive backing and printed markings.
1. Electrical conduit markers shall include three identifying titles on an orange background except as noted.
   a. Typical
      1) Type Example – AC 60 Hertz
      2) Load Example – Lighting and Power
      3) Voltage Example – 480 VAC / 3 Phase
   b. As Noted
      1) If more than one type of power is available in a conduit, then it shall be marked with the title “Electrical” on orange background.
      2) Limit switch controls, air conditioning controls and diffuser controls shall be marked with the title “Control” on an orange background.
2. Conduit that contains protective or communications systems shall have the exact content and title on blue background and installed and located as specified for conduit.

F. Conduit Markers and Letter Size
1. Dimensions

Outside Diameter of Conduit in Inches	Width of Color Band in Inches	Height of Letter & Numerals in Inches
½ to 1-1/4	8	½
1-1/2 to 2	8	¾
2-1/4 to 3-1/4	10	1
3-1/2& Larger	12	1-1/4

PART 3 - EXECUTION

3.1 IDENTIFICATION OF EQUIPMENT

A. Identification of Equipment:

1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Take care not to obliterate this nameplate. The legend on all nameplates or tags shall correspond to the identification shown on the Operating Instructions.
2. A black-white-black (red-white-red for emergency circuits) 3 layer laminated plastic engraved identifying nameplate shall be permanently secured to each switchboard, distribution panel, motor control center, transformer, panelboard, safety disconnect switch, wireway, busduct plug, terminal cabinet, surge protection device, capacitor, individual motor controller, contactor and communications (voice, data, video) cabinet or rack with stainless steel screws.
   a. Identifying nameplates shall have 1/2-inch high, engraved letters. For equipment designation and ¼-inch letters indicating source circuit designation, (i.e.: “PANEL HA –served from MDP-6”).
   b. Each switchboard, distribution panel, and motor control center branch circuit device shall have a nameplate showing the load served in ¼-inch high, engraved letters.
   c. Enclosed switches, starters, circuit breakers and contactors: Provide neatly typed label inside each motor starter and contactor enclosure door identifying motor or load served, nameplate horsepower, full load amperes, code letter, service factor, and voltage / phase rating. Provide Phenolic nameplate on cover exterior to indicate motor or load served, panel(s) and circuit(s) serving load(s), description and location of control controlling contactor (i.e.: contactor controlled by switch in Room A107.), and panel and circuit feeding line side of control transformer. Example of label for lighting / receptacle contactor: Lighting Contactor
      Panel HA 2,4,6
      Control circuit – Panel HA 2,4
      Location – West parking Lot Pole Lights
      Switched - BMCS
3. Cardholders and directory cards shall be furnished for circuit identification in panelboards. Cardholder shall be located on inside of panel door and shall be in a metal frame with clear plastic front, or in a clear plastic schedule holder. Circuit lists shall be typewritten. Circuit descriptions shall include explicit description and identification of items controlled by each individual breaker, including final graphics room number or name designation and name of each item served. If no building appointed room number or name is given, list locations per the following examples – A. Storage in Rm 100 – B. Office in Rm 100 – C. Storage west of Rm. 100. List corridors as “corridors”. Identify circuits controlled by contactors using a separate notation for each contactor used. List notation at bottom of schedule stating the circuits are controlled by a contactor, list exact location of contactor, and how switched. Do not use architectural room number designation shown on plans. Obtain final graphics room number identification from Architect’s final room number graphics plan. All locations served by breakers shall be listed on schedule. Panel schedule shall be large enough to contain all information required. Also refer to Section 26 24 16.
4. Permanent, waterproof, black markers shall be used to identify each lighting and power grid junction box, clearly indicating the panel and branch circuit numbers available at that junction box. Where low voltage relay panels are used for lighting control, identify the low voltage relay panel and number in addition to the branch circuit panel and number.
5. Pull Boxes, Transformers, Disconnect Switches, etc.: Field work each with a name plate showing identity, voltage and phase and identifying equipment connected to it. The transformer rating shall be shown on the panels or enclosures. For an enclosure containing a motor starter, the nameplate shall include the Owner’s motor number, motor voltage, number of motor phases, motor load being serviced, motor horsepower, and motor full load current.

Nameplates shall also indicate where panel is fed from.

B. Prohibited Markings: Markings intended to identify the manufacturer, vendor, or other source from whom the material has been obtained are prohibited for installation in public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters Laboratories), and approval labels are exceptions to this requirement.

C. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of electrical facilities. Provide text of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with industry standards for color and design.

D. Wire and Cable Markers: Provide vinyl cloth markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.

E. Wire and Cable Labeling: Provide wire markers on each conductor in all boxes, pull boxes, gutters, wireways, contactors, and motor controllers and load connection. Identify with panelboard / switchboard branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

F. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch wide plastic tape, colored red or orange with suitable warning legend describing buried electrical lines; telephone lines and data lines. All underground electrical conduits shall be so identified. Tape shall be buried at a depth of 6-inches below grade and directly above conduits or ductbanks. Provide magnetic marking tape below all underground electrical conduits.

3.2 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.

D. Embossed tape will not be accepted.

E. Provide underground tape at all electrical installations.

3.3 CONDUIT MARKERS

A. Location of Identifying Markers: At each end of conduit run and at intermediate points 50' on center maximum.

END OF SECTION

SECTION 26 05 73

ARC FLASH HAZARD ANALYSIS / SHORT-CIRCUIT / COORDINATION STUDY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this section.

1.2 SUMMARY

A. The contractor shall furnish short-circuit and protective device coordination studies as prepared by Eaton Engineering Services or approved equal.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E – Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584-2002, the IEEE Guide for Performing Arc-Flash Calculations.

C. The Scope of the studies shall include new distribution equipment supplied by the original equipment manufacturer (OEM) under this contract.

D. Related Sections include the following:
1. Division 26 Section “Summary of Electrical Work”

1.3 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
4. IEEE 241 – recommended Practice for Electric Power Systems in Commercial Buildings
5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
6. IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations

B. American Nation Standards Institute (ANSI):
1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers
2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories

C. The National Fire Protection Association (NFPA)
1. NFPA 70 – National Electrical Code – latest edition
2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.4 SUBMITTALS FOR REVIEW / APPROVAL

A. The studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, approval from the Engineer may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. The formal study will be provided to verify preliminary findings.

1.5 SUBMITTALS FOR CONSTRUCTION

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Electronic PDF copies of the report shall be provided upon request.

B. The report shall include the following sections:
1. Executive Summary including Introduction, Scope of Work, and Results / Recommendations
2. Short-Circuit Methodology Analysis Results and Recommendations
3. Short-Circuit Device Evaluation Table
4. Protective Device Coordination Methodology Analysis Results and Recommendations
5. Protective Device Settings Table
6. Time-Current Coordination Graphs and Recommendations
7. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
8. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical images.
9. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment calculated maximum short-ci9rcuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

1.6 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be an employee of the equipment manufacturer or an approved engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed in the past year.

E. The engineering firm shall have a minimum of twenty-five (25) years' experience in performing power system studies.

1.7 COMPUTER ANALYSIS SOFTWARE

A. The studies shall be performed using SKM Systems Analysis Power Tools for Windows (PTW) software program.

PART 2 – PRODUCT

2.1 STUDIES

A. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E – Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies. All studies to be prepared by the OEM engineering services.

2.2 DATA

A. Contractor shall furnish all data as required for the power system studies. The engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source combination may include present and future motors and generators.

C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner or Contractor.

D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:
1. Calculation methods and assumptions
2. Selected base per unit quantities
3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.
4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
3. The OEM shall notify Architect / Engineer in writing of any circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph a complete title with descriptive device names

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
1. Electric utility's overcurrent protective device
2. Medium voltage equipment overcurrent relays
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance and damage bands.
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
6. Medium voltage conductor damage curves
7. Ground fault protective devices, applicable
8. Pertinent motor starting characteristics and motor damage points, where applicable
9. Pertinent generator short-circuit decrement curve and generator damage point
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:
1. A One-Line Diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram.
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. The OEM shall notify Architect / Engineer in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.5 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.3) and the protective device time-current coordination analysis (Section 2.4).

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

G. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

H. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented with time. Fault contribution from motors should be decremented as follows:
1. Fault contribution from induction motors should not be considered beyond 5 cycles.

I. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

J. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

K. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

L. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 Section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

M. Provide the following:
1. Results of the Art-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
2. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device setting for equipment within the scope of the study.
3. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 – EXECUTION

3.1 FIELD ADJUSTMENT

A. Contractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. The OEM shall notify Owner in writing of any required major equipment modifications.

3.2 ARC FLASH LABELS

A. The OEM's Engineering Services shall provide a 4.0 inch x 4.0 inch Brady thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The labels shall be designated according to the following standards:
1. UL 969 – Standard for Marking and Labeling Systems
2. ANSI Z535.4 – Product Safety Signs and Labels
3. NFPA 70 (National Electric Code) – Article 110.16

C. The label shall include the following information:
1. System Voltage
2. Flash protection boundary
3. Personal Protective Equipment category
4. Arc Flash Incident energy valve (cal/cm^2)
5. Limited, restricted, and prohibited Approach Boundaries
6. Study report number and issue date

D. Labels shall be printed by a thermal transfer type printer, with no field markings.

E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
1. Floor Standing Equipment – Labels shall be provided on the front of each individual section. Equipment requiring rear and / or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
2. Wall Mounted Equipment – labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
3. General Use Safety Labels shall be installed on equipment in coordination with the Arc Flash Labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

F. Labels shall be field installed by OEM's Field Services. The technician providing the installation shall have completed an 8-hour instructor led Electrical Safety Training Course which includes NFPA 70E material including the selection of personal protective equipment.

END OF SECTION

SECTION 26 09 25

ELECTRICAL CONTACTORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Miscellaneous electrical contactors as shown, required, scheduled, and specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Provide products produced by one of the following:
Schneider Electric - Square D
ABB-General Electric
Eaton

2.2 CONTACTORS

A. Provide contactors as shown, required, and specified. The number of poles, ampere-ratings, and pole arrangements shall be as required. Contactors shall conform to the following:
1. Rated for continuous duty at full rated current in an unventilated enclosure. Eight-hour duty ratings are not acceptable.
2. Contacts shall be readily replaceable, self-aligning, silver alloy.
3. Load contactors shall be rated for not less than 30A continuous rating. Auxiliary contacts shall be rated for not less than 10 amperes.
4. Contactors rated for lighting and mixed loads shall have an interrupting capacity of 150% of their continuous duty rating.
5. Contactors shall be capable of successfully handling inrush currents at 20 times rating.
6. Provide a minimum of two spare load contacts on each individual contactor rated 60A or less for future use.

B. Electrically held devices shall conform to the following:
1. AC operated units shall have laminated low loss electrical steel core pieces with machine ground pole faces and shading coils.
2. Units rated at 300A and above shall have DC operating coils and include the necessary rectifier for the AC/DC operation.
3. Normally open contactors shall be spring-loaded open and magnetically closed.
4. Contactors for emergency lighting or power shall be normally closed.

C. Controls: Individual contactors operated by automatic controls shall have 30.5mm HAND-OFF-AUTOMATIC switches, otherwise provide HAND-OFF switches. Contactor controls shall be mounted in the contactor enclosure cover. Contactors serving receptacle loads controlled by local switching shall not have Hand-Off-Auto nor Hand-Off switching.

D. Control Power. Provide dedicated 120-volt circuit for contactor control power and indicator pilot lights. Do not use same circuit feeding load.

E. Enclosure:
1. Contactors and control enclosures installed in indoor locations shall be NEMA 1 heavy-duty enclosures unless shown otherwise.
2. Contactors and control enclosures installed at kitchen and food preparation locations, hose down areas, cooling towers, exterior locations, in greenhouses, and in other corrosive areas shall be NEMA 4X, stainless steel.

F. Minimum interrupting rating shall be 35KAIC.

PART 3 - EXECUTION

3.1 INSTALLATION OF MISCELLANEOUS ELECTRICAL CONTROLS

A. Provide electrically held contactors, with line side wiring complete, in accordance with the National Electrical Code and manufacturer's recommendations.

B. Fuses: Install fuses where coil control power is fed from line side of contactor.

C. Adjustment: Adjust operating mechanisms for free mechanical movement.

D. Coordinate contactor control and operation requirements with the Building Management Control System.

E. Identify each contactor as specified in Section 26 05 00.

F. Contactors shall not be installed above ceiling and shall be readily accessible. Locate contactors in same room as panelboard serving the load unless otherwise indicated.

3.2 INTERIOR AND EXTERIOR LIGHTING CONTROL

A. Parking lot lighting, building mounted exterior lighting, and exterior signage shall be controlled by separate lighting contactors by the specified Building Management and Control System. Interior lighting as noted on the plans shall be controlled as noted on the plans and as specified by the Building Management and Control System. Contractor shall circuit all systems to be controlled by the Building Management and Control System through contactors compatible with system controls and shall ensure the control and operation of lighting control system is complete.

B. Provide mechanically held contactors where control is three-wire, momentary control signal.

C. Provide electrically held contactors where control is two-wire, constant control signal for open or close.

D. Provide normally closed contactors for emergency lighting and power circuits where contactors are indicated or required.

E. Provide normally closed contactors for circuits controlled by "emergency power off" or teacher control switches in science classrooms, computer labs, and vocational instructional areas.

END OF SECTION

SECTION 26 09 28

DIGITAL LIGHTING CONTROLS

PART 1 - GENERAL

1.1 INTRODUCTION

A. The work covered in this section is subject to all of the requirements in the General Conditions of the Specifications. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system.

B. Contractor shall provide to the digital lighting control equipment manufacturer all quantities for system including but not limited to room controllers, occupancy sensors, button stations, photocells, emergency lighting controllers, and wire lengths for room controller communications bus.

C. Contractor shall demonstrate to the Owner, the complete successful operation of system including but not limited emergency lighting operation. Demonstration shall occur a minimum of 30 days prior to the contract schedule completion date. Installing electrical contractor shall replace any failed material during warranty period of one year at no additional cost to the Owner.

D. Refer to the drawings and other specifications in Division 23 and 26 regarding lighting controls for exterior lighting and other interior areas indicated for control by the Building Management Control System (BMCS) or other means other than the digital lighting controls specified in this section.

E. Factory startup and commissioning for substantial completion, 90-day verification re-commissioning, and 11-month close-out commissioning shall be provided.

1.2 QUALITY ASSURANCE

A. Component Pre-testing: All components and assemblies are to be factory pre-tested and burned-in prior to installation.

B. NEC Compliance: Comply to NEC as applicable to electrical wiring work.

C. NEMA Compliance: Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

1.3 SYSTEM DESCRIPTION & OPERATION

A. The lighting control system as defined under this section covers the following equipment for local room or local area networks only. Building wide network equipment is not required and shall not be provided unless those capabilities are inherent to the base components required or specified for local room controls only.
   1. Digital Room Controllers – Self-configuring, digitally addressable relay controllers with 0-10-volt dimming control for lighting and single relay application-specific plug load controllers when plug load control is specified or required.
   2. Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
   3. Digital Switches – Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications.
   4. Digital Photosensors – If Code required, single-zone closed loop and multi-zone open loop daylighting sensors with two-way active infrared (IR) communications that can provide switching or dimming control for daylight harvesting.
   5. Configuration Tools – Handheld remote for room configuration provides two-way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow send and receive of room variables and store of occupancy sensor settings.
   6. Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.

7. DLM Lighting control system components shall have the capability to be easily expanded in the future to a building wide network functionally using all of the following topologies: a fully wired network.

B. Lighting controls and automation for exterior lighting and interior areas not controlled by the system specified in this section shall be as required and as specified by other specification sections in Division 23, and 26.

C. Power and communications for lighting controls provided shall be wired. Use of batteries or wireless communications is prohibited. Dimming control wiring shall not be installed with any line voltage power wiring conduits.

1.4 SUBMITTALS

A. Submit the specification line-by-line compliance review, shop drawings, and the product data specified below under one cover as a complete submittal.
1. Specification compliance review: refer to Electrical Shop Drawings specification section for instructions and additional information.
2. Shop Drawings:
a. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted).
b. Scale drawing for each area showing the exact location of each sensor, room controller, and digital switch.
3. Product Data: Catalog sheets, specifications and installation instructions.
a. Include data for each device which:
b. Indicates where sensor is proposed to be installed.
c. Prove that the sensor is suitable for the proposed application.

1.5 WARRANTY

A. Wattstopper Digital Lighting Management (DLM) control products: Provide a five-year complete manufacturer’s warranty on all products to be free of manufacturers’ defects.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. WattStopper (Legrand North America, LLC)
1. System: Digital Lighting Management (DLM). No Substitutions.

2.2 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

A. Ceiling mounted (or where specifically indicated or required to be wall mounted to suit installation); passive infrared (PIR), ultrasonic, or dual technology (passive infrared and ultrasonic) digital occupancy sensor. Furnish the system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
1. Digital calibration and pushbutton programming for the following variables:
a. Sensitivity – 0-100% in 10% increments
b. Time delay – 1-30 minutes in 1-minute increments
c. Test mode – Five second time delay
d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
e. Walk-through mode
f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
2. One or two RJ-45 port(s) for connection to DLM local network.
3. Two-way infrared (IR) transceiver to allow remote programming through handheld

commissioning tool and control by remote personal controls.
4. Device Status LEDs including:
   a. PIR Detection
   b. Ultrasonic detection
   c. Configuration mode
   d. Load binding
5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
6. Manual override of controlled loads.

C. Units shall not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required.

E. WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC, LMDW

2.3 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configurations; grey, compatible with building standard stainless-steel wall plates with decorator opening. Wall switches shall include the following features:
1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
3. Red configuration LED on each switch that blinks to indicate data transmission.
4. Blue Load/Scene Status LED on each switch button with the following characteristics:
   a. Bi-level LED
   b. Dim locator level indicates power to switch
   c. Bright status level indicates that load or scene is active
5. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.

B. Two RJ-45 ports for connection to DLM local network.

C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

D. The following switch attributes may be changed or selected using a wireless configuration tool:
1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
2. Individual button function may be configured to toggle, ON only or OFF only.
3. Individual scenes may be locked to prevent unauthorized change.
4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
5. Ramp rate may be adjusted for each dimmer switch.
6. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

E. WattStopper product numbers: LMSW-210, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMSW-211.

2.4 ROOM CONTROLLERS

A. Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers shall be simple to install and shall not have dip switches, potentiometers or require special configuration. The control units shall include the following features:
1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
3. Device Status LEDs to indicate:
   a. Data transmission
   b. Device has power
   c. Status for each load
   d. Configuration status
4. Quick installation features including:
   a. Standard junction box mounting
   b. Quick low voltage connections using standard RJ-45 patch cable
5. Plenum rated
6. Manual override and LED indication for each load
7. Dual voltage (120/277 VAC, 60 Hz)
8. Zero cross circuitry for each load.

B. ON/OFF/Dimming enhanced Room Controllers shall include:
1. Real time current monitoring
2. One, two or three relay configurations
3. Efficient 250 mA switching power supply
4. Four RJ-45 DLM local network ports.
5. One 0-10-Volt analog output per relay for control of compatible LED drivers.
6. The following dimming attributes may be changed or selected using a wireless configuration tool:
   a. Establish preset level for each load from 0-100%
   b. Set high and low trim for each load
7. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.
   a. One relay configuration only
   b. Automatic-ON/OFF configuration
8. WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMPL-201,

2.5 DIGITAL PHOTOSENSORS

A. Digital photosensors work with room controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to a room controller. Closed loop photosensors measure the ambient light in the space and control a single lighting zone. Open loop photosensors measure incoming daylight in the space and are capable of controlling up to three lighting zones. Photosensors shall be interchangeable without the need for rewiring.

B. Digital photosensors include the following features:
1. An internal photodiode that measures only within the visible spectrum and has a response curve that closely matches the photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.
2. Sensor light level range shall be from 1-10,000 footcandles (fc).
3. The capability of switching one-third, one-half or all lighting ON and OFF, or raising or lowering lighting levels, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
4. For switching daylight harvesting, the photosensor shall provide a deadband or a separation between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling after they turn off.
5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a user-selectable minimum level.
6. Optional programmable wall switch override to allow occupants to reduce lighting level to increase energy savings or raise and lower lighting levels for a selected period of time or cycle of occupancy.
7. Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

8. Red configuration LED that blinks to indicate data transmission.
9. Blue status LED indicates test mode, override mode and load binding.
10. Recessed switch to turn controlled load(s) ON and OFF.
11. One RJ-45 port for connection to DLM local network.
12. An adjustable head and a mounting bracket to accommodate multiple mounting methods and building materials. The photosensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox.

C. Closed loop digital photosensors include the following additional features:
1. An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.
2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
3. Automatically establishes setpoints following self-calibration.
4. A sliding setpoint control algorithm for dimming daylight harvesting with a “Day Setpoint” and the “Night Setpoint” to prevent the lights from cycling.
5. WattStopper Product Number: LMLS-400.

D. Open loop digital photosensors include the following additional features:
1. An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room.
2. Automatically establishes setpoints following calibration using a wireless configuration tool or a PC with appropriate software.
3. A proportional control algorithm for dimming daylight harvesting with a “Setpoint” to be maintained during operation.
4. WattStopper Product Number: LMLS-500.

2.6 ROOM OR AREA NETWORK

A. The DLM local network shall be a free topology lighting control physical connection and communication protocol. Digital room devices connect to the network using CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. The DLM local network shall include:
1. Plug n’ Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off-the-shelf unit without requiring commissioning, configuration or setup.
3. Push n’ Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30-feet from a sensor, wall switch or IR receiver.

2.7 CONFIGURATIONS TOOLS

A. A configuration tool facilitates optional customization of DLM local networks and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include:
1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30-feet.
2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
3. Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.
4. Save up to nine occupancy sensor setting profiles and apply profiles to selected sensors.
5. Temporarily adjust the light level of any load(s)on the local network and incorporate those levels in scene setting.

6. Adjust or fine-tune daylighting settings established during auto-commissioning and input light level data to complete commissioning of open loop daylighting controls.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

2.8 EMERGENCY LIGHTING

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF/Dimming control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting to be fully bright ON until normal power is restored. Features include:
1. 120/277 volts, 50/60 Hz., 20-amp driver rating
2. Push to test button
3. Auxiliary contact for remote test or fire alarm system interface.

B. WattStopper Product Numbers: ELCU-200.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION:

A. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Provide a minimum of eight hours of on-site technical support for the coordination between the BMCS and the Wattstopper lighting controls. Ensure that the sequences of operation involving the BMCS are fully operational as specified and as required.

B. The installing contractor shall, prior to request of WattStopper factory start up and site commissioning, request an on-site meeting by including local factory representative, Owner and the general contractor, to assist in identification of any open-ended issues, thereby eliminating potential for delays and system commission interruptions.

C. Upon confirmation of progress by local factory authorities, the installation electrical contractor shall complete the start-up request form found in the WattStopper submittals, including any field changes from the contract documents. This is essential to facilitate substantial completion.

D. Room controllers shall be installed so that they are easily accessible for replacement or maintenance:
1. Mount lighting control equipment to junction boxes as recommended by the manufacturer.
2. Where accessible ceiling heights are 10-feet AFF or less, room controllers shall be mounted on wall above local control switch location between 4 and 18-inches above the accessible ceiling and 2-inches clear of T-grid for above ceiling access.
3. Where ceiling heights are above 10-feet, room controllers shall be mounted in an ancillary area above the ancillary area local control switch location with accessible ceiling of 10-feet or less. The high ceiling room controller shall be mounted adjacent to the lower ceiling room controller serving the ancillary area. The room controller for the high ceiling and ancillary area(s) may utilize the same room controller for each area if practical. If an ancillary area with low accessible ceiling area is not available, the room controller shall be installed in the same mechanical or electrical room as the electrical panel serving the lighting for that area and clearly labeled for its use and specific room that it controls.
4. Smaller ancillary spaces not separated by doors that adjoin the larger space do not require an additional control zone and shall be controlled with the larger adjoining space zone to reduce complexity.

E. Lighting controls shall meet the minimum requirements of all local codes in effect when the project will be permitted with whatever exceptions deemed appropriate by the Owner. Wherever possible, minimize the complexity of the controls design to reduce the quantity and types of required sensor hardware, low voltage and line voltage wiring:
1. Provide UL 924 emergency load control devices so that designated emergency interior light fixtures will be controlled ON/OFF/dimmed with adjacent area lighting and be brought to full-bright ON during power failure.

2. Provide full floor area occupancy/vacancy sensor coverage wherever sensors are required.
3. Provide 20-miniute time out delay where vacancy sensor control is provided or required.
4. Provide 20-miniute or IECC maximum time out delay, whichever is shortest, where occupancy sensor control is provided or required.

F. Where daylighting controls are required or indicated they shall be fully automatic and full range dimming without local user overriding of the daylighting maximum light level set point or trim level. Local user override to dim to OFF shall be provided. A single photo sensor shall be interfaced with the room controller for each daylighting zone in an area and for each cardinal direction as required by the IECC, and as recommended by the lighting control system vendor.

G. Low voltage cabling installed above ceiling shall be supported every 5 feet at a minimum height of 3 feet above grid/ceiling but no closer than six inches below deck. Support system shall be ceiling wire attached to structure and clipped to ceiling support grid using Caddy drop wire securing clip #EC311. Cabling shall hang plumb to devices. Low voltage control wiring shall not be installed in the same raceway with line voltage wiring.

H. Renovation areas: Utilize existing wall box switch locations where line voltage wiring is removed and therefore can be utilized for low voltage control controls and control cabling unless shown or noted otherwise.

3.2 GENERAL SEQUENCES OF OPERATION

A. Refer to plan and plan details for additional information for specific areas and additional requirements. Where plans or plan details are in conflict with these specifications, provide the more stringent of the two, however verify with the Owner/Architect for clarification for the exact requirements to be provided prior to construction at no additional cost to the Owner.

B. Areas with lighting that requires dimming: Manual ON shall initially bring the lighting level to lighting control system 80-percent set point but not lower than the minimal CFISD design standard-maintained foot-candela light level for the type of space served. Refer to CFISD's Electrical-Light Fixture standards for required maintained light levels. Contractor/vendor shall verify in the field with CFISD during the commissioning process typical acceptable light levels with all ceilings and walls installed and with final paint and finishes applied. It is CFISD's intention to adjust the trim points to a minimally acceptable light level and only adjust as needed due to light fixture lumen depreciation over the lifetime of the light fixtures. This will increase energy savings and extend the lifetime of the lighting system.

3.3 SEQUENCES OF OPERATION FOR SPECIFIC AREAS – REFER TO PLAN DETAILS FOR ADDITIONAL PROJECT SPECIFIC INFORMATION AND INSTRUCTIONS

A. CORRIDORS, STUDENT AND PUBLIC TOILETS/RESTROOMS ACCESSIBLE DIRECTLY FROM CORRIDORS, AND STAIRS: Includes all hallways and other egress pathways, including attached open access without doors, ancillary spaces such as flex or collaboration spaces, student and public toilets/restrooms with or without a door open to corridor, (This does not include large areas open to the corridor pathway such as the adjoining seating areas of cafeteria, dining, commons, nor shall it include administrative staff toilets or restrooms).
1. Control through BMCS. BMCS occupied (turn ON) or unoccupied (turn OFF) state sent to DLM room controllers. Single DLM occupancy sensor and Hubbell key switch at each security keypad. Sensor to be used for auto ON only; sensor shall not turn corridor lights OFF. Dimming only if required for code required daylight harvesting.
2. Provide DLM occupancy sensor for body movement detection in corridors (maximum spacing 50-feet) to only turn all corridor lights ON. Provide hand motion sensor coverage in adjoining toilets/restrooms. Provide a DLM Hubbell momentary SPDT key switch next to each security keypad to manually turn corridor lights ON only (to be used if there is a DLM sensor failure or BMCS failure or if BMCS is in un-occupied state). Key switch shall not turn lights OFF. Any corridor occupancy sensor shall trigger all corridor DLM room controllers to turn lights ON at any time of day and will remain ON until a BMCS unoccupied state in which the lights shall turn OFF.

3. Corridors and their attached open access ancillary general use spaces and attached student/public toilets with or without corridor doors shall be grouped together. Do not switch general use ancillary spaces including student/public toilets with or without doors separately from the corridor that have direct access from an adjoining corridor.
4. Flex or collaboration spaces open to corridors shall be a separate dimming control zone but shall be grouped with the adjoining corridor's occupancy sensors and BMCS control for BMCS ON/OFF and sensor ON.
4. Corridor Hubbell SPDT key switch shall be located at each security system control keypad and shall have both load terminals shunted so that either up or down position will turn the lights ON. Label key switches as "CORRIDOR LTG ON".
5. Do not provide a fire alarm interface since sensors do not turn lights OFF.
6. DLM locations and quantities shall be kept to a minimum. Multiple corridors shall be grouped and controlled together as much as practical. Individual corridors do not require individual local controls. All corridors are either all on or all off.
7. Lighted display cases in corridors: Circuit with corridor lighting and with additional local manual line voltage key switch required by IECC identified as "CASE LTG".
8. Provide separate local switching or dimming for open ancillary flex spaces only if indicated.
9. No light switches in enclosed stairs. Switch and control all stair floor landings with the first-floor corridor except that one or more light fixture at each floor landing shall be controlled with that respective floor's corridor lighting. Do not provide sensors in stairs. Un-enclosed stairs shall be considered an extension of the adjoining corridor or space and shall share the adjoining corridor or space-controlled lighting line voltage circuits/zone. Do not provide a separate zone for un-enclosed stairs open to adjoining spaces.

B. INSTRUCTION AND ADMINISTRATIVE AREAS, OFFICES, LOUNGES/BREAK ROOMS, COPY/PRINT ROOMS, AND SIMILAR AREAS, STORAGE ROOMS THAT ARE 100 SQUARE FEET AND LARGER.
1. SEQUENCE: Provide vacancy sensor control (DLM system manual ON/OFF, auto OFF, DIM).
2. Instructional areas, classrooms, and large group instruction up to 99-person occupancy provide single zone dimming with DLM control at each entry door. Provide additional zones if the room is equipped with room divider partitions.
3. Large Group Instruction over 100-person occupancy: Provide up to three dimming zones, one over the presentation display area, one over the seating area, and one for any other specialty lighting or enhanced zone functionality. Provide DLM system master control station only at the main entry door or near the presentation area. Provide entry station(s) at each entry door to provide ON/OFF general lighting.

C. SHOPS, KITCHEN, FOOD SERVING QUEUE, AND NATATORIUM
1. BMCS to interface with DLM room controllers for occupied/un-occupied state. Un-occupied state shall turn lights off. No occupant sensors for safety and security. Local DLM switches also function as a local override. No dimming
2. Kitchen/serving: Manual local DLM switches. Locate kitchen/serving switches in supervised locations for on/off control. Occupancy sensor for auto ON only, sensor shall not turn kitchen/serving lights OFF. No dimming (health code lighting requirement supersedes IECC).
3. Shops: Provide lighting with less than 0.6-Watts per square foot for IECC exception to not require lighting reduction controls or dimming. Occupancy sensor for auto ON only, sensor shall not turn shop lights OFF. No dimming.
4. Natatorium: Safety and security: BMCS unoccupied state shall turn lights OFF. No automatic sensor lighting controls, no dimming, no light reduction controls. ON/OFF with Hubbell key switches located at main entry/exit door and as directed by CFISD. Provide manual DLM switch for ON/OFF control in swimming coaches' office or other supervised location as directed by CFISD. The DLM room controller for the natatorium shall be located above an accessible low height ceiling, preferably next to the coaches' office DLM room controller, or as directed by CFISD.

D. CAFETERIA, CAFETORIUM, GYMS, LIBRARY, STAGE, LOCKER ROOMS
1. BMCS to interface with DLM room controllers for occupied/un-occupied state. Un-occupied state shall turn lights OFF. No occupant sensors for safety and security. Local

DLM switches also function as a local DLM override. Dimming only as required for light reduction, code required daylight harvesting, and as indicated on drawings.

2. Cafeterias and cafetorium's: DLM Hubbell SPDT key switches at cafetorium main entry. Dimming switches at main entry and on stage. Cafeterias require only one dimming zone. Cafetorium with stage: Provide up to three dimming zones, zoned from front of house to back of house.
3. School stage general lighting: General lighting for stages and platforms with proscenium curtains or wall dividers shall be controlled as a separate zone. Provide a separate zone for back-of-house stage access ramps. Provide DLM ON/OFF control for the stage general lighting at each entry/exit point to the stage. Provide ramp lighting ON/OFF DLM control at each end of the ramp. Verify zoning and switch locations with theatrical consultant drawings.
4. Elementary School Cafetorium Theatrical Track Lighting: Locate four ganged wall box 120-volt line voltage dimmer controls on stage at an accessible location, not obstructed by stage curtains, as indicated or as directed by CFISD.
5. Library: Manual DLM control located in supervised area (behind circulation desk or as directed by CFISD). Hubbell SPDT key switch at main entry door location as directed by CFISD. If dimming zones are provided locate dimming controls in a secured area (circulation desk). Key switch ON function shall force all lights to full bright.
6. Gyms: Manual DLM Hubbell SPDT key switch. Provide separate zones with Hubbell key switch to enable UIL competition light level for UIL Sports Lighting Standards. Label key switch for UIL competition light level control as court as "UIL COMPETITION ONLY".
7. Locker rooms: Occupancy sensors control for auto ON/OFF: Set sensors to full-bright on and 20-minute time delay off for safety and security. Manual ON/OFF with DLM Hubbell momentary SPDT key switches located at main entry doors and as directed by CFISD. Provide lighting in these areas with less than 0.6-Watts per square foot for IECC exception to not require lighting reduction controls.

E. CLOSED-DOOR ADMINSITRATIVE OR PRIVATE TOILETS/RESTROOMS, DRESSING ROOMS, OTHER TOILETS/RESTROOMS WITH DOORS NOT DIRECTLY CONNECTED TO A CORRIDOR:
1. SEQUENCE: Occupancy sensors (DLM system manual ON/OFF, automatic ON/OFF).
2. Provide dual technology occupancy sensor control for automatic ON/OFF based on occupancy. Set occupancy time delay and sensitivity to device setting maximum for safety and security.
3. Student/public restrooms with doors not connected to an adjacent egress corridor: Provide CFSID standard Hubbell momentary key switch at student and public toilets/restrooms entry door location for manual DLM ON/OFF.
4. Private or administrative toilets/restrooms: Provide standard DLM ON/OFF switch for all other restrooms and dressing rooms with doors.

F. MECHANICAL, ELECTRICAL, PLUMBING, ELEVATOR, AND TECHNOLOGY ROOMS
1. Provide line voltage mechanical time switch withhold at each entry door, wired in parallel as required. Refer to Line Voltage Wiring Device specifications.

G. CUSTODIAL, JANITORIAL, STORAGE LESS THAN 100SF, UTILITY ROOMS, FREE STANDING REMOTE BUILDINGS (CONCESSION, PRESS BOX, TICKETING, ETC.)
1. DLM vacancy sensor, no dimming except for press box viewing space.

H. BLACK BOX THEATRES
1. Black box theatres shall be provided with standalone instructional lighting, lighting controls and emergency lighting typical of instructional areas and classrooms.

3.4 IDENTIFICATION FOR LIGHTING CONTROL SYSTEM EQUIPMENT

A. Above ceiling lighting control system equipment locators: Provide plastic tape machine typed name plate to bottom of ceiling T-grid below relay location. White letters on black background with ¼" high letters on ½" tall label for digital lighting module indicate as: DLM.

B. Room controller identification: Label each digital room controller with 120/277 Volt circuit (i.e., "HD-27") and room graphic name and number. Do not use architectural room name or number on

drawings, use room graphic identification only.

C. All low voltage wiring shall have “WattStopper” printed on the wire jacket.

3.5 ATTIC STOCK

A. Provide a minimum of 2 or 5 percent of the project total, whichever is greater, of all other hardware components used.

B. Provide five configuration handheld remote tools for new facilities or three remote configuration handheld remote tools for renovation facilities.

3.6 FACTORY COMMISSIONING

A. The installing electrical contractor shall complete, prior to request of WattStopper factory start up and site commissioning, complete installation of all devices, their respective loads landed and confirmed operations, switches installed and confirmed operation of each and every local room network. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The installing electrical contractor shall provide a preliminary as-built drawing prior to commissioning. Drawing shall include room by room device ID’s and locations of all WattStopper devices.

C. The factory commissioning shall include the following services. Programming of all button stations, configuration of all occupancy sensors and photocells. Verification of a complete working system.

D. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
2. Sequence of operation, (e.g., manual ON, Auto OFF. etc.)
3. Load Parameters (e.g., blink warning, etc.)

E. The electrical contractor shall provide in writing, both the manufacturer and Owner, with 21-Owner business days written notice of the requested system startup and adjustment date.

F. The electrical contractor shall provide at least (1) journeyman electrician, familiar with the installation of the system, dedicated to assisting the factory start-up technician for the entire duration of the commissioning process.

G. Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the Owner's personnel on the adjustment and maintenance of the system.

H. Re-commissioning – After 90 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner’s Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

I. Close-out commissioning - After 11-months from substantial completion, re-calibrate sensor time delays and sensitivities to Owner’s Satisfaction at no additional cost to the Owner. Provide a detailed report to the Architect / Owner of re-commissioning activity.

END OF SECTION 26 09 28

SECTION 26 12 13

PAD-MOUNTED TRANSFORMERS, LIQUID FILLED

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Liquid-filled pad-mounted transformers.

1.2 REFERENCES

A. IEEE C37.47™ - Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses

B. IEEE C57.12.00™ - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers

C. IEEE C57.12.34™ – Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 2,500 kVA and Smaller: High Voltage, 34,500 GrdY/19,900 Volts and Below; Low Voltage, 480 Volts and Below.

D. ANSI C57.12.28 - Switchgear and Transformers, Pad-Mounted Equipment - Enclosure Integrity

E. IEEE C57.12.90™ - Standard Test Code for Liquid-Immersed Distribution Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers

F. IEEE C57.13™ - Requirements for Instrument Transformers

G. ANSI/IEEE 386 - Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

H. ASTM D877 - Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes

I. NEMA AB1 - Molded Case Circuit Breakers

J. CAN/CSA-C88-M90 - Electrical Power Systems and Equipment

K. UL – Underwriters Laboratories, Transformers, Distribution, Liquid Filled Type, Over 600 Volts

1.3 SUBMITTALS

A. Submit shop drawings indicating outline dimensions, connection and support points, weight, specified ratings and materials.

B. Submit product data indicating standard model design tests and options.

C. Submit manufacturer's installation instructions.

D. Specification Compliance Review: Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Engineer/Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy with the product data.

1.4 OPERATION AND MAINTENANCE DATA

A. Include procedures for sampling and maintaining fluid, maintaining unit, and replacing components.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in distribution transformers with three years documented experience.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Square D Company

B. General Electric

C. S & C

D. Cooper Power Systems

2.2 FLUID-FILLED PAD-MOUNTED TRANSFORMERS

A. The transformer(s) shall be UL Listed, compartment type, self-cooled, for mounting on a pad and shall comply with the latest applicable standards.

B. The average temperature rise of the windings, measured by the resistance method, shall be 65° C when the transformer is operated at rated kVA output. The transformer shall be capable of being operated at rated load in a 30° C average, 40° C maximum ambient, as defined by IEEE C57.12.00™ without loss of service life expectancy.

C. Coolant and insulating fluid shall be less flammable seed oil.

D. The high and low voltage compartments shall be located side by side, separated by a steel barrier. When facing the transformer, the low voltage compartments shall be on the right. Terminal compartments shall be full height, air-filled, with individual doors. The high voltage door fastenings shall not be accessible until the low voltage door has been opened.

E. The following accessories shall be provided as standard on all transformers:
1. Nameplate in low voltage compartment.
2. 1” upper filter press and filling plug
3. 1” Drain valve with sampling device.
4. Tap changer with silver-plated stationary and movable contacts, for de-energized operation only, which is externally operable and pad lockable.
5. The front of both compartments shall be removable to allow the transformer to be rolled or skidded into position over conduit stubs. ANSI tank grounding provisions shall be furnished in both compartments.
6. Dial type thermometer.
7. Magnetic liquid-level gauge.
8. Pressure vacuum gauge.
9. Pressure relief valve.
10. Pentahead bolts for compartment doors.
11. Nitrogen test port
12. Nitrogen blanket

F. The transformer(s) shall be self-cooled (ONAN). Primary voltage shall be 12.5 kV delta; secondary voltage 277/480V wye, 4-wire, 60 Hz with two 2-1/2% full capacity above normal and two 2-1/2% below normal taps. Impedance shall be 5.75% +/- 7.5%. Basic impulse level of the primary winding shall be as specified in IEEE C57.12.00™ for comparable kV class; secondary 480V/277, 30 kV BIL.

G. Transformer shall be high efficiency per DOE 2010, 99.42% at 50% load.

H. The transformer shall be of sealed-tank construction of sufficient strength to withstand a pressure of 7 psi without permanent distortion. The cover shall be welded and the hand hole fastenings tamper-resistant. The transformer shall remain effectively sealed for a top oil temperature range of –5° C to 105° C. When required, cooling panels will be provided on the back and sides of the tank. Lifting eyes and jacking provisions will be provided.

I. Coils shall be wound with copper conductors.

J. All cores to be constructed of high grade, grain-oriented, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux is to be kept well below the saturation point.

K. The high voltage terminations and equipment shall be dead front.

L. HV dead front bushings shall 200 Amp, either universal wells or one-piece integrated for use with separable connectors. Bushings shall be externally clamped and front removable.

M. The low voltage bushings (≤600V) shall be molded polymer, and provided with blade-type spade terminals with NEMA standard hole spacing arranged for vertical take-off. The low voltage neutral shall be an insulated bushing, grounded to the tank by a removable ground strap.

N. Provide a load break, gang operated, liquid immersed switch rated at 200 A that is externally operable from the high voltage compartment through the use of a distribution hot-stick. Switch to be 2-position "OFF-ON" type for use on a radial feed-system. 2-position switches to be used as "sectionalizing" switches on extended radial or loop-feed systems with feed-from-the-left, feed-from-the-right, isolated-from-either-side, or through-feed-to-both-sides.

O. Provide internal, liquid-immersed cartridge fuses sized at approximately three times the primary full load current.

R. Surge Protection - Provide three 15 kV distribution class lightning arresters for surge protection. Arresters are to be mounted in the high voltage compartment.

S. Additional Accessories
1. Automatic pressure relief device (self-sealing with indicator).
2. Key interlock to primary or secondary compartment door.
3. Bushing well inserts
4. Feed-thru inserts.

T. Transformer shall be UL listed.

U. Transformer shall be FM labeled.

V. Testing - Tests shall be conducted in accordance with the provisions of IEEE C57.12.90™ and shall include, as a minimum, the following tests:
1. Ratio
2. Polarity
3. Phase Rotation
4. No-Load Loss
5. Excitation Current
6. Impedance Voltage
7. Load Loss
8. Applied Potential
9. Induced Potential
10. QC Impulse Test

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pads are ready to receive work.

B. Verify field measurements are as instructed by manufacturer.

C. Verify that required utilities are available, in proper location and ready for use.

D. Beginning of installation means Contractor accepts conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install safety labels to NEMA 260.

3.3 FIELD QUALITY CONTROL

A. Test dielectric liquid to ASTM D877, using 25,000 volts minimum breakdown voltage, after installation and before energization from system.

B. Test transformer to IEEE C57.12.90™.

3.4 ADJUSTING

A. Adjust primary taps so that secondary voltage is within 2% of rated voltage.

3.5 ADDITIONAL REQUIREMENTS

A. Remove the existing pad mounted transformers and deliver to Owner’s off-site storage yard, location as directed by Owner.

B. Prior to scheduled transformer replacement, field verify existing condition of primary cable and elbow cable terminations, with the Owner and Engineer present. Replace existing primary cable elbow terminations unless directed otherwise by owner and engineer.

END OF SECTION

SECTION 26 12 15

DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work Included: Low Voltage (less than 600 Volt) transformer work as shown, scheduled, indicated, and specified.

B. Types: Transformers required for the project include dry-type transformers.

1.2 QUALITY ASSURANCE

A. Standards: Transformers shall be designed and tested in accordance with NEMA and ANSI C33.4 and C89.2 standards.

B. UL Label: Transformers shall be UL labeled.

1.3 STANDARDS

A. UL-506

B. ANSI C75.11

C. NEMA ST-20

D. DOE 2016 Efficiencies

1.4 SUBMITTALS

A. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, sound level, tap configurations, insulation system type and rated temperature rise.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Schneider Electric - Square D

B. General Electric

C. Siemens

D. Eaton

E. Acme

F. Hammond

2.2 MATERIALS AND COMPONENTS

A. Except as otherwise indicated, provide transformer manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended, and as required for a complete installation.

2.3 DRY-TYPE TRANSFORMERS

A. General: Indoor transformers shall be dry-type, multiple-winding transformers, rated as shown, and shall have manufacturer's standard impedance.

B. Construction: Transformer core shall be constructed of cold-rolled, oriented, high permeability silicon steel, either formed as a coil or laminated.

C. Taps: Transformers 15 to 30 kva shall have two 5% taps, one above and one below normal. Transformers 45 kva and larger shall have four 2-1/2% taps, two above and two below normal.

D. Temperature Rating: Transformers shall use an insulation system that has been temperature classified and approved by UL. Transformers shall have a maximum winding temperature rise of 150°C with an insulation system temperature classification of 220°C.

E. Load Rating:
1. Transformers shall be capable of operating at 100% of nameplate rating continuously while in an ambient temperature not exceeding 40°C.
2. Transformers shall be capable of meeting the daily overload requirement of ANSI C57.12.

F. Vibration Isolation: Each transformer core and coil shall be mounted in the transformer enclosure on rubber vibration isolators.

G. Sound Rating: The transformer shall have sound levels equal to or lower than those ratings established in NEMA ST-20 and as shown in the following table. Sound ratings shall be measured in accordance with ANSI C89.91.

Transformer Rating (kva) (600 Volt Class)	Maximum Sound Level Decibels: NEMA ST-20
0 to 9	40
10 to 50	45
51 to 150	50
151 to 300	55
301 to 500	60

H. Testing:
1. The manufacturer shall have tested each transformer for proper operation before shipment.
2. The manufacturer shall have performed the following additional tests on units identical to the design type being supplied. Furnish proof of performance of these tests in the form of test data sheets upon request:
   a. Sound levels.
   b. Temperature rise tests.
   c. Full-load core and winding losses.
   d. Percent regulation with 80 and 100% power factor load.
   e. Percent impedance.
   f. Exciting current.
   g. Insulation resistance.

PART 3 - EXECUTION

3.1 INSTALLATION OF TRANSFORMERS

A. General: Install transformers where shown, in accordance with the manufacturer's written instructions and industry practices to ensure that the transformers meet the specifications. Comply with requirements of NEMA and NEC standards, and applicable portions of NECA Standard of Installation, for installation of transformers. Transformers shall be floor mounted. Ceiling mounted transformers are not acceptable.

B. Dry-Type Transformer Mounting: Indoor, floor mount transformer on properly sized Amber/Booth Type RVD rubber-in-shear vibration isolators. Only where specifically indicated on the plans or approved in writing by the Owner/Engineer, transformers shall be trapeze mounted using properly sized Amber/Booth type BRD rubber-in-shear hangers. Transformer enclosures shall make no contact with wall surfaces.

C. Conduit: Conduit directly connected to transformer enclosures shall be flexible liquid tight conduit extending for a minimum of 18-inches and a maximum of 24 inches from transformer enclosure as measured along the conduit centerline. Include a ground wire, size in accordance with NEC, internal in each length of flexible conduit.

D. Grounding: Ground and bond transformers as a separately derived system unless noted otherwise, refer to NEC 250. Installation of bonding strap or bonding conductor between ground and neutral bus shall be witnessed by the Engineer prior to applying power and terminating secondary conductors.

3.2 TESTING

A. Insulation Tests: Before energizing, check transformer windings for continuity.

B. Winding Current: During initial no-load energizing, check current in each primary winding.

C. Tap Settings: Measure and record load current and voltage of transformers while loaded to verify proper transformer tap settings.

D. Submittals: Furnish instruments and personnel required for tests. Submit four copies of certified test results to Engineer for review. Reports include transformer tested, date and time of tests, relative humidity, temperature, and weather conditions.

E. Notification: Notify Engineer in writing of any deviation from manufacturer's pre-shipment test data.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work Included: Switchboard work as shown, scheduled, indicated, required, and specified.

1.2 QUALITY ASSURANCE

A. UL Labels: Provide switchboards UL labeled for service entrance and meeting requirements of UL 891.

B. NEMA Compliance: Comply with National Electrical Manufacturers Association (NEMA) Standard PB2, "Dead-Front Distribution Switchboards."

1.3 SUBMITTALS

A. Indicate:
1. Detailed dimensions for equipment foot print, front and side elevations.
2. Conduit entrance locations and requirements and restrictions.
3. Enclosure material, finish, and NEMA classification type.
4. Nameplate legends.
5. Size and number of bus bars
6. Switchboard instrument details.
7. Electrical characteristics including voltage, ampacity, overcurrent device frame size and trip ratings, withstand ratings, and time current curves of all overcurrent devices and components.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Schneider Electric - Square D

B. ABB General Electric Co.

C. Eaton

2.2 MATERIALS AND COMPONENTS

A. Except as otherwise indicated, provide switchboard manufacturer's materials and components as indicated and as required for a complete installation.

2.3 DEAD-FRONT DISTRIBUTION SWITCHBOARDS

A. The overcurrent protective device short circuit, coordination and arch flash studies performed by the overcurrent protective device manufacturer shall be used by the respective switchgear vendor(s) to select appropriate equipment, switchgear, and overcurrent protective device characteristics such as but not limited to: equipment bracing, AIC rating, circuit breaker frame size and trip settings, and fuse type/class. The appropriate equipment suitable and required by the studies for code compliance shall be included with the submittal data for review and provided at no additional cost to the Owner. The appropriate equipment recommended by the studies for enhanced selective coordination or enhanced arc flash energy reduction beyond code compliance shall be included with the submittal data for review and consideration purposes by the engineer.

B. Provide a factory-assembled, dead-front construction, metal enclosed, self supporting, switchboard of voltage, phase, ampacity, and short circuit interrupting rating and bracing shown.
1. Switchboard shall consist of the required number of front and rear aligned vertical sections bolted together to form one metal enclosed rigid switchboard. The switchboard shall be designed as a free-standing with only front access. Rear and/or side access only where

indicated to reduce switchboard depth and where NEC required rear access clearance is available.

2. Switchboard shall include protective devices and equipment shown with interconnections, instrumentation, and control wiring. Small wiring, necessary fuse blocks, and terminal blocks in the switchboard shall be provided. Groups of control wires leaving the switchboard shall be furnished with terminal blocks with numbering strips.
3. Factory installed permanent lock-off provision for pad-locking in the off position for all protective devices.

C. Enclosure Construction: The switchboard framework shall be fabricated for floor mounting. The framework shall be formed code gauge steel, welded and bolted together to support cover plates, busing, and component devices.

1. Each section shall have an open bottom and individually removable top plates for installation and termination of conduit. Top and bottom conduit areas shall be shown and dimensioned on the shop drawings. Front plates used for mounting meters, selector switches, or other front-mounted devices shall be hinged, with wiring installed and laced, and with flexibility at the hinged side. Closure plates shall be screw removable and small enough for easy handling by one technician.
2. Weatherproof enclosure front door(s) shall be pad-lockable and suitable for the intended environmental conditions. When indicated or specified, rear doors shall also be pad-lockable.

D. Busing: The switchboard busing shall be copper.

1. The bus bars shall be braced to comply with the integrated equipment rating of the switchboard. The main horizontal bus bars between sections shall be located on the back of the switchboard to permit maximum available conduit entry area. The horizontal main bus bar supports, connections, and joints shall be bolted or welded, as required, so as not to require periodic maintenance. Bolted joint connections shall have at least two bolts per joint per phase. Half lapped bus joint construction is not acceptable.
2. Buses shall be arranged A-B-C, left-to-right, top-to-bottom, and front-to-rear throughout. A ground bus shall be secured to each vertical section structure and extend the entire length of the switchboard.
3. The main horizontal bus and incoming line shall be isolated and insulated from outgoing busing and cable connections.
4. Each group mounted section shall have maximum full height bus. Where space is indicated, space shall be bused to install future switches or future circuit breakers sized as shown or a 600 Amp frame size circuit breaker or switch, whichever is greater.
5. The main horizontal bus shall be non-tapered, fully rated, extended and drilled for future additions and splice plates.

E. Integrated Equipment Rating: Each switchboard, as a complete unit, shall be given a single integrated equipment rating by the manufacturer. The integrated equipment short circuit rating shall certify that equipment can withstand the stresses of a fault equal to that shown in RMS symmetrical amperes. Ratings shall have been established by actual tests by the manufacturer on similar equipment construction as the subject switchboard. This test data shall be available and furnished, if requested, with or before the submittal of shop drawings.

F. Indicating Instruments: Shark 250 series, digital display, remote mounted, rated for 120V, 60 hertz. The display unit shall be UL listed in accordance with UL 508. Provide internal switchboard voltage and current transformers recommended by Shark or as provided by the switchboard OEM as would be provided for OEM power quality meter instrument. Remote NEMA 1 Self Enclosure, E1-WC-6 Series CT’s

G. The Main Protective Device(s) shall be individually mounted molded case circuit breaker(s):

1. Adjustable: current, I^2t settings, ground fault (where required), instantaneous trip, and short time trip. Solid state true RMS sensing, without fusible elements, 100-percent continuous current rating.
2. Main protective devices with frame rated at 1000 Amps or greater shall have integral ground fault interrupter and provided with a portable test set or test switch.
3. Circuit breakers with 1,200 Amp frame and above shall have Energy Reducing Maintenance System switch with local status indicator (ERMS).
4. Provide shunt trip capability and wiring to terminal block for remote shunt trip switch wiring

termination weather remote trip device is indicated or not.

H. Feeder and Branch Protective Devices greater than 1,200 Amps shall be individually mounted:
1. Molded case circuit breakers:
a. Adjustable: current, I^2t settings, ground fault (where required), instantaneous trip, and short time trip. Solid state trip true RMS sensing, without fusible elements; 100-percent continuous current rating.
b. Energy Reducing Maintenance System switch with local status indicator (ERMS).
c. Shunt trip capability and wiring to terminal block for remote shunt trip switch wiring termination weather remote trip device is indicated or not.
2. Fusible switches:
a. Each switch shall have an individual door over the front, equipped with a voidable interlock that prevents the door from being opened when the switch is in the ON position unless the interlock is purposely defeated by activation of the voiding mechanism. All switches shall have externally operated handles.
b. Fused switches 600 Amps and below, equipped for class J fuses.
c. Fused switches 601 Amps and above shall be equipped with Class R or L rejection type fuse holders. Class RK1 or L of ampere rating and type as indicated on the plans suitable for application of the system.
d. When required by the latest edition of the NEC or the AHJ, 1,200 Amp switches regardless of fuse size installed shall have Energy Reducing Maintenance System switch with local status indicator (ERMS).

I. Feeder and Branch Protective Devices 1,200 Amps and below shall be group mounted:
1. Molded case circuit breakers:
a. Greater than 250 Amp: Solid state true RMS sensing with adjustable: current, I^2t settings, ground fault (where required), instantaneous trip, and short time trip; 80-percent continuous current rating.
b. 250 Amp and smaller: Solid state true RMS sensing with fixed current setting by rating plug or dial. Breaker shall have adjustable instantaneous trip function with short time tracking.
c. 1,200 Amp frame circuit breakers regardless of trip shall have Energy Reducing Maintenance System switch with local status indicator (ERMS).
2. Fusible switches:
a. Quick-make, quick-break units utilizing the double-break principle of circuit interrupting to minimize arcing and pitting and shall conform to the ratings shown.
b. Individual door over the front, equipped with a voidable interlock that prevents the door from being opened when the switch is in the ON position unless the interlock is purposely defeated by activation of the voiding mechanism. All switches shall have externally operated handles.
c. 600 Amps and below equipped for Class J fuses.
d. 601 Amps and above shall be equipped for Class R or L rejection type fuse holders.
e. When required by the latest edition of the NEC or the AHJ, 1,200 Amp fused switches regardless of fuse size installed shall have Energy Reducing Maintenance System switch with local status indicator (ERMS).

J. Ground Fault Interrupter (GFI) protection: Where shown or required, ground fault protection shall be achieved with adjustable pickup for ground fault currents, field-adjustable from 200 amperes and instantaneous to 60 cycle time delay. The ground fault protection system shall include necessary current sensors, internal wiring, and relays to coordinate opening the monitored faulted circuits.
1. Ground fault protection shall be set at minimum setting for both current and time during construction. The switchboard manufacturer shall include in the submittal data for the switchboard, the minimum setting of the devices and the recommended setting for normal building operation.
2. The ground fault system shall be factory-tested before shipment as specified:
a. The switchboard manufacturer shall provide a factory ground fault protection system test for circuit testing and verification of tripping characteristics. The manufacturer shall pass predetermined values of current through the sensors and measure the tripping time for each phase and neutral. The measured time-current relationships shall be compared to the trip-characteristic curves. If the ground fault device trips outside the range of values indicated on the curve, the

ground fault device shall be replaced or recalibrated.

b. Relays, electrically operated switches, shunt-trip switches, circuit breakers, and similar items shall have proper voltages applied to their circuits and satisfactory operation demonstrated.

c. Upon completion of the factory ground fault protection system test, the current and time on each ground fault device shall be set to minimum values.

K. Mimic bus: Indicate busing, connections, and devices in single line form on the front panels of the switchboard using red colored plastic strips, fastened flat against the panel face with screws.

PART 3 - EXECUTION

3.1 INSTALLATION OF SWITCHBOARDS

A. Install switchboards where shown, in accordance with the manufacturer's written instructions, and industry practices to ensure that the switchboards meet the specifications. Provide weatherproof NEMA 3R enclosure housing outdoors, at wet locations, or where indicated on the drawings. Provide NEMA 3RX enclosure housing at corrosive locations of either aluminum or stainless-steel construction suitable for the intended environment when indicated on the drawings.

B. Comply with the requirements of NEMA and NEC, and NECA Standard of Installation, for installation of switchboards.

C. Where switchboard is used or indicated as the utility service building disconnect, provide main bonding jumper and neutral to ground bond connected to the building’s grounding system. Do not bond neutral to ground when there is a neutral to ground bond upstream from the same derived neutral system serving the switchboard.

D. Torque bus connections and tighten mechanical fasteners.

E. Install fuses, of ratings shown, in each switchboard. Provide spare fuse cabinet with three fuses of each size provided. Locate in central plant as directed by Owner.

F. Concrete Pads: Re-use existing concrete pads where practical, provide additional switchboard pull sections and/or size individual cubicles to mate with existing conduits stubbed up at bottom of switchboard. Install switchboards on a 4" reinforced concrete housekeeping pad. The housekeeping pad shall extend 3" beyond the housing of the switchboard unless shown otherwise. Switchboard shall be bolted to the housekeeping pad using 3/8" minimum galvanized bolts and anchors on 30" maximum centers. Furnish the exact position of any block outs, dimensions, and location of the housekeeping pads to prevent delay of the concrete work.

G. Adjustment: Adjust operating mechanisms for free mechanical movement. Adjust circuit breaker time characteristic curves as recommended by the Fault Current and Coordination Analysis or as directed by the Engineer.

H. Indicating Instruments: Provide initial factory start-up and programming with Owner present. Integrate with the Building Management System for monitoring and logging of all system data.

3.2 TESTING

A. Notify Owner’s Commissioning Authority (CxA) prior to performing any tests so that the CxA may witness tests at the CxA’s discretion.

B. Pre-energization checks: Before energizing, check switchboards for continuous of circuits and for short circuits.

C. Switchboard insulation resistance test: Each switchboard bus shall be insulation resistance tested after installation is complete except for line and load side connections. Tests shall be made using Biddle Megger or equivalent test instrument at a voltage of not less than 1000 vDC. Resistance shall be measured from phase-to-phase and from phase-to-ground. Minimum acceptable value for insulation resistance is 2 megohms.

D. Ground Fault Interrupter (GFI) test: After completion of construction and before final acceptance testing, the ground fault protection system shall be field-tested and reset to the manufacturer's settings for both current and time by a representative of the manufacturer's engineering service department. After the test, set ground fault to 50 percent of overcurrent device rating or 1,200 Amperes, whichever is lower.

E. Provide thermal infrared scan of switchboard under full load as directed and witnessed by Owner. Correct any deficiencies causing abnormal heating and repeat the scan. Provide digital video documentation with deficiencies corrected for comparison to future test. Make corrections as needed as soon as possible as directed by the Owner. Repeat the scan at the 11-month prior to closeout, and make corrections prior to close-out.

F. Submittals: Furnish instruments and personnel required for tests. Submit 4 copies of certified test results to the Architect for review. Test reports shall include switchboard tested, date and time of test, relative humidity, temperature, and weather conditions.

3.3 TRAINING

A. Provide minimum 2 hours of dedicated training provided by a factory authorized representative to Owner’s personnel regarding programming, operating, and use of switchboard components including all indicating instruments and safety features.

END OF SECTION

SECTION 26 24 16

PANELBOARDS AND ENCLOSURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Panelboards and enclosures, including cabinet, as shown, scheduled, indicated, and specified.

1.2 QUALITY ASSURANCE

A. UL Standards: Panelboards and enclosures shall confirm to all applicable UL standards and shall be UL labeled.

1.3 SUBMITTALS

A. Indicate:
1. Detailed dimensions.
2. Enclosure material, finish, and NEMA classification type.
3. Location of main circuit breaker.
4. Mounting and trim.
5. Acceptable incoming conductors' size.
6. Electrical characteristics including voltage, ampacity, overcurrent device frame size and trip ratings, bus material and rating, withstand ratings, lugs, and time current curves of all overcurrent devices and components.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Schneider Electric - Square D

B. ABB-General Electric Co.

C. Eaton

2.2 MATERIALS AND COMPONENTS

A. General: Panelboards shall be dead-front type equipped with fusible switches or circuit breakers as shown and as required.

B. The overcurrent protective device short circuit, coordination and arch flash studies performed by the overcurrent protective device manufacturer shall be used by the respective switchgear vendor(s) to select appropriate equipment, switchgear, and overcurrent protective device characteristics such as but not limited to: equipment bracing, AIC rating, circuit breaker frame size and trip settings, and fuse type/class. The appropriate equipment suitable and required by the studies for code compliance shall be included with the submittal data for review and provided at no additional cost to the Owner. The appropriate equipment recommended by the studies for enhanced selective coordination or enhanced arc flash energy reduction beyond code compliance shall be included with the submittal data for review and consideration purposes by the engineer.

C. Busing Assembly: Panelboard phase, neutral, and equipment ground busing shall be copper. Bus structure and mains shall have ratings as shown and scheduled. Furnish a bare uninsulated ground bus inside each panelboard enclosure. Two section panelboards shall be connected with copper cable, with an ampacity conforming to the upstream overcurrent device. Neutral bus termination quantity for branch circuit panelboards shall match or exceed the maximum number of single pole circuit breakers the panelboard will accept.

D. Main circuit breakers and feeder / branch circuit breakers:
1. Less than 125 Amps: Thermal magnetic with factory fixed trip.
2. 125-600 Amps: Thermal magnetic with adjustable instantaneous trip of 5X – 10X with

short time tracking.

3. 601 Amps and larger: Solid state true RMS sensing with adjustable: current set by rating plug or adjustable dial, I^2t settings, ground fault (where required), instantaneous trip, and short time trip; 80-percent continuous current rating.
4. Provide permanent lock-off device for all fire alarm system branch circuit breakers, for all smoke control fans and equipment, and where indicated or required for circuit breaker to be used as a remote safety disconnect switch.
5. General requirements:
   a. Make prepared space provisions for additional breakers or fused switches so that no additional bus or connectors will be required to add circuit breakers or fused switches in the available device mounting space.
   b. Two and three pole breakers shall have internal common trips.
   c. All circuit breakers used as the main or branch mounted back-fed main shall be bolt-on. All circuit breakers used in 600 Amp and smaller panelboards shall be bolt-on breakers. Circuit breakers for distribution panelboards rated 601 amps and larger shall have plug-on or bolt-on circuit breakers.
   d. Branch circuit panelboard shall have interrupting capacity as shown or as required, but in no case less 10k AIC for 120/208/240-Volt systems, and 18k AIC for 277/480-Volt systems.
   e. 15 and 20 Amp circuit breakers for lighting circuits shall be UL listed switch duty (SWD).
   f. Personnel ground fault interrupter (GFI) circuit breakers, where shown, shall be maximum 5 mA ground fault trip and shall include a TEST button.
   g. Equipment ground fault interrupter (EGFI/EGPD) circuit breakers, where shown or required shall be 30mA ground fault trip and shall include TEST button.
   h. Circuit breakers with 1,200 Amp and larger frame shall have Energy Reducing Maintenance Switching with local status indicator (ERMS).

E. Fusible Switches for distribution panelboards: Fusible switches shall be quick-make, quick-break type. Each switch shall be enclosed in a separate steel enclosure. The enclosure shall employ a hinged cover for access to the fuses. Interlock cover with the operating handle to prevent opening the cover when the switch is in the ON position. This interlock shall be constructed so that it can be overridden for testing fuses without interrupting service. The switches shall have padlocking provisions in the OFF position. Switches shall include positive pressure rejection type fuse clips for use with UL Class J fuses and be UL labeled for 200,000 AIC.

F. Spaces: Where space for future breakers or switches is shown, panelboard enclosure shall include removable blank panels or knockouts to allow installation of future breakers or switches, prepared spaces, and panelboard busing shall be complete, including required connectors.

G. Integrated Equipment Rating: Do not apply series ratings. Each panelboard, as a complete unit, shall have a short-circuit rating equal or greater than the available short circuit current. Rating shall have been established by tests on similar panelboards with the circuit breakers or fusible switches installed.

H. GFCI circuit breakers not available in the required panel AIC rating shall be series rated with the upstream over current protection device to provide the panelboard with required AIC rating. Coordinate series rating requirements with manufacturer. Mark the panel per NEC 110. The marking shall be visible and state the following: "CAUTION-ENGINEERED SERIES COMBINATION SYSTEM RATED XXX AMPERS. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED”.

I. Panelboard Enclosures:
1. Provide sheet steel enclosures, minimum 16-gauge nominal thickness, with multiple knockouts, unless shown otherwise. Provide all NEMA 1 panelboard fronts with spring-loaded door pulls, and flush lock and key, panelboard enclosures keyed alike to match the Owner’s standard key system; coordinate with Owner.
2. All NEMA 1 enclosure panelboards shall be hinged “door-in-door” type with interior hinged door with hand operated latch or latches, as required providing access only to circuit breaker or fusible switch operating handles, not to exposed energized parts. Outer hinged door shall be securely mounted to the panelboard box with factory bolts, screws, clips, or

other fasteners, requiring a tool for entry. Hand operated latches are not acceptable. Push inner and outer doors shall open left to right. Manufacturer hardware (OEM), screws, and bolts shall be used to secure dead fronts and covers. Do not used third party hardware. Do not use power tools to secure panel hardware. Provide gray powder coat finish over a rust inhibitor.

3. Equip with interior circuit directory frame, card, and clear plastic covering for panelboards.
4. Panelboards located in kitchen preparation or natatorium areas shall have Type 316 stainless steel front, door, and trim with a NEMA 1 rating for the entire enclosure.
5. Panelboards at exterior locations shall be NEMA 4X Type 316 stainless steel.
6. Panelboards at hose down areas, cooling towers, in greenhouses, and other corrosive locations shall be NEMA 4X 316 stainless steel.
7. Enclosure shall be for recessed or surface mounting as shown or as required.
8. Enclosures shall be fabricated by the same manufacturer as panelboards to be enclosed. Multi-section panelboards shall have same physical dimensions.

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELBOARDS AND ENCLOSURES

A. General: Install panelboards and enclosures, as shown, including electrical connections, in accordance with the manufacturer's written instructions, the requirements of NEC, NECA Standard of Installation, and industry practices. Circuit breakers shall be factory installed except for required field modifications due to actual site conditions.

B. Coordination: Coordinate installation of panelboards and enclosures with conductor and raceways installation work.

C. Anchoring: Anchor enclosures to walls and structural surfaces ensuring that they are permanently and mechanically secured.

D. Directory Card: Provide a typed circuit directory card(s) upon completion of work. Directory card shall be of super heavy-weight index card stock, 110 lb, white. Directory shall include type of load (i.e.: receptacles, lighting, exhaust fan, etc.) and location (i.e.: Room 102, Office, etc.) Room number shall be identified as the actual graphics room number assigned to the space and not the room number identified on the Plans. Circuits with shunt trip shall be identified with the control circuit operating the shunt trip (i.e.: Kitchen Hood No. 2). Shunt trip breakers with common trip circuit shall be grouped in the panelboard (i.e.: circuits 1, 3, 5 and 7).

E. Fuses: Install fuses, of the ratings and class shown.

F. Circuit Arrangement: Branch circuits shall be arranged to provide the best possible phase balance, unless shown otherwise.

G. Panelboards not intended to be used as service entrance (SE) rated or for establishing a separately derived neutral system shall have the factory installed neutral to ground bonding screws and straps removed and disposed of.

H. Recessed or flush mounted panelboards: Terminate spare conduits in junction box 18-inches above accessible ceiling close to panelboard location. Label junction box cover as “not used” and include panel identification.

1. Provide (3) 1-inch and (3) ¾-inch spare conduits above accessible ceiling to j-box from each panelboard section.
2. Where recessed panelboard is located above another building floor, also provide (3) 1-inch and (3) ¾-inch conduits to j-box in ceiling space on floor below.

I. Conductors shall be bent neatly opposite the fuse switch or circuit breaker to which they are to be attached. Vertically installed conductors shall be neatly tie-wrapped. Conductors shall be connected in a neat and professional manner. Conductors brought in from the top or bottom of the cabinet shall be bent neatly opposite the fuse or circuit breaker to which they are to be attached. Each conductor shall be run along the full height of the panel and returned to the circuit breaker or fuse location to allow relocation of the conductor to any position along the bus. Panelboard shall be cleaned of all construction debris prior to substantial completion review. Neutral and grounding

conductors shall be installed similar to the phase conductors.

J. Circuit breakers and conductors installed for SPD devices shall be located on the same side as the SPD to allow the shortest and straightest run of conductors in respect to the location of the SPD device. Route all conductors to the SPD device with straight as possible run, using longest sweep bends and the shortest conductor length possible. Twist all SPD conductors and secure with tie straps wherever possible.

K. Install copper ground bus for copper ground conductors. Ground conductors size #1 and larger are to be landed to panelboard enclosure with mechanical lugs and not to ground bus.

L. Install panels so that breaker number 1 is the top left breaker.

M. In panels that contain multi-layered neutral bus, install neutrals beginning with the back neutral bus row and work forward. Do not make up neutrals on front neutral bus row unless all other rows are full.

N. Label breaker mounting space with stick-on number labels.

O. Mount the fully aligned panelboard such that the maximum height of the top circuit breaker above the finished floor shall not exceed 78-inches. Mount panelboards as high as practical and such that the bottom of the cabinets will not be less than 6 inches above the finished floor.

3.2 TESTING

A. Before energizing, energization, check for continuity of circuits and short circuits.

B. Provide thermal infrared scan of panelboards under full load as directed and witnessed by Owner. Correct any deficiencies causing abnormal heating and repeat the scan. Provide digital video documentation with deficiencies corrected for comparison to future test. Make corrections as needed as soon as possible as directed by the Owner. Repeat the scan at the 11-month prior to closeout, and make corrections prior to close-out.

END OF SECTION

SECTION 26 24 25

ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Safety and disconnect switch work where required, scheduled, indicated, specified, and required. For switches indicated or rated above 1,200 Amps, provide switchboard construction as specified for switchboards.

B. UL Approved: Safety and disconnect switches shall have UL approval and the UL label.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Schneider Electric - Square D

B. ABB-General Electric Co.

C. Eaton

2.2 ENCLOSED SWITCHES

A. General: Provide heavy duty type, dead-front, sheet steel enclosed, surface-mounted safety switches of the type and size indicated. Safety switches shall be rated for the voltage of the circuit where they are installed. Safety switches used as motor disconnects shall be rated for the motor horsepower served.

B. The overcurrent protective device short circuit, coordination and arch flash studies performed by the overcurrent protective device manufacturer shall be used by the respective switchgear vendor(s) to select appropriate equipment, switchgear, and overcurrent protective device characteristics such as but not limited to: equipment bracing, AIC rating, circuit breaker frame size and trip settings, and fuse type/class. The appropriate equipment suitable and required by the studies for code compliance shall be included with the submittal data for review and provided at no additional cost to the Owner. The appropriate equipment recommended by the studies for enhanced selective coordination or enhanced arc flash energy reduction beyond code compliance shall be included with the submittal data for review and consideration purposes by the engineer.

C. Switch Mechanism:
1. Safety switches shall be quick-make, quick-break type with permanently attached arc suppressor. Constructed so that switch blades are visible in the OFF position with the door open. The operating handle shall be an integral part of the box, not the cover. Switch shall have provision to padlock in the OFF position. Safety switches shall have a cover interlock to prevent unauthorized opening of the switch door when the switch mechanism is in the ON position, or closing of the switch mechanism when the switch door is open.
2. Cover interlock shall have an override mechanism to permit switch inspection by authorized personnel. Current-carrying parts shall be constructed of high conductivity copper with silver-plated switch contacts. Lugs shall be suitable for copper conductors and front removable.

D. Neutral: Provide safety switches with number of switched poles indicated. Where a neutral is present in the circuit, provide a solid neutral with the safety switch. Where a ground conductor is present in the circuit, provide a separate solid ground with the safety switch.

E. Auxiliary Contacts: Disconnect switches related to all smoke control fans shall have auxiliary contacts for fire alarm system monitoring of the position of the disconnect switch.

2.3 ENCLOSED SWITCHES WITH OVERCURRENT AND/OR GROUND FAULT PROTECTION

A. Overcurrent protective devices 1,200 Amps and below:
   1. Where switch is intended as a building service disconnect provide solid neutral and ground bus and service entrance SE rating.
   2. Molded case circuit breakers:
      a. Greater than 800 Amp: Solid state true RMS sensing with adjustable: current, I^2t settings, ground fault (where required), instantaneous trip, and short time trip; 80-percent continuous current rating.
      b. 800 Amp and smaller: Solid state true RMS sensing with fixed current setting by rating plug or dial. Breaker shall have adjustable instantaneous trip function with short time tracking.
      c. 1,200 Amp and larger frame circuit breakers regardless of trip shall have Energy Reducing Maintenance System switch with local status indicator (ERMS).
   3. Fusible switches:
      a. Quick-make, quick-break units utilizing the double-break principle of circuit interrupting to minimize arcing and pitting and shall conform to the ratings shown.
      b. Individual door over the front, equipped with a voidable interlock that prevents the door from being opened when the switch is in the ON position unless the interlock is purposely defeated by activation of the voiding mechanism. All switches shall have externally operated handles.
      c. 600 Amps and below equipped for Class J fuses.
      d. 601 Amps and above shall be equipped for Class R or L fuses.
      e. When required by the latest edition of the NEC or the AHJ, 1,200 Amp fused switches regardless of fuse size installed shall have Energy Reducing Maintenance System switch with local status indicator (ERMS).

B. Ground Fault Interrupter (GFI) protection: Where shown or required, ground fault protection shall be achieved with adjustable pickup for ground fault currents, field-adjustable from 200 amperes and instantaneous to 60 cycle time delay. The ground fault protection system shall include necessary current sensors, internal wiring, and relays to coordinate opening the monitored faulted circuits.
   1. Ground fault protection shall be set at minimum setting for both current and time during construction. The manufacturer shall include in the submittal data the minimum setting of the device and the recommended setting for normal building operation.
   2. The ground fault system shall be factory-tested before shipment as specified:
      a. The manufacturer shall provide a factory ground fault protection system test for circuit testing and verification of tripping characteristics. The manufacturer shall pass predetermined values of current through the sensors and measure the tripping time for each phase and neutral. The measured time-current relationships shall be compared to the trip-characteristic curves. If the ground fault device trips outside the range of values indicated on the curve, the ground fault device shall be replaced or recalibrated.
      b. Relays, electrically operated switches, shunt-trip switches, circuit breakers, and similar items shall have proper voltages applied to their circuits and satisfactory operation demonstrated.
      c. Upon completion of the factory ground fault protection system test, the current and time on each ground fault device shall be set to minimum values.

2.4 ENCLOSURES

A. Enclosures in indoor locations shall be NEMA 1 unless shown otherwise.

B. Enclosures in exterior locations shall be NEMA 4X stainless steel.

C. Enclosures at kitchen and food preparation locations, exterior kitchen supply and exhaust fans, hose down areas, cooling towers, in greenhouses, and in other corrosive areas shall be NEMA 4X, stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install safety and disconnect switches where required or indicated, in accordance with the

manufacturer's written instructions, requirements of the NEC, NECA Standard of Installation, and industry practices. Provide fuse identification label when fused switches are required showing type and size inside door of each switch. Include devices in coordination study to indicate overcurrent devices will selectively coordinate.

B. Location: Provide safety switches within 50’ and in sight of motor served. There shall be minimum code required clearance in front of safety switch and a clear path in which to access the switch. (i.e.: not having to walk and/or stand on obstacles such as drain pans on floor to service).

C. Supports: Provide all safety and disconnect switches with galvanized angle or other supports where mounting on wall or other rigid surface is impractical. Switches shall not be supported by conduit alone. Where safety and disconnect switches are mounted on equipment served, the switch shall not inhibit removal of service panels or interfere with access areas, not void the warranty of the equipment served. Provide mounting hardware that will allow removal of safety and disconnect switches with common work tools. Do not utilize drive pin anchors through enclosure.

D. Ground Fault Interrupter (GFI) test and settings: Where adjustable ground fault interrupter settings are provided or required, after completion of construction and before final acceptance testing, the ground fault protection system shall be field-tested and reset to the manufacturer's settings for both current and time by a representative of the manufacturer's engineering service department. After the test, set ground fault to 50-percent of the overcurrent device rating.

E. Safety and Disconnect Switches: Install disconnect switches for motor-driven equipment, appliances, motors, and motor controllers within sight of the controller position unless indicated otherwise.

F. Variable Frequency Drive (VFD) Warning Plaque: Provide VFD warning plaque at safety disconnect switches which are located down-stream of VFDs. Secure plaque to disconnect switch or immediately adjacent to disconnect switch with fasteners. Plaque shall be Yellow-White-Yellow 3-layer plastic laminated engraved with: “WARNING” (1/2 Inch Letters). “TURN OFF VFD BEFORE OPENING THIS SWITCH FOR MAINTENANCE.” (1/4 inch letters).

G. Provide disconnect switch for electric duct heaters.

H. Where disconnect switch is used or indicated as the utility service building disconnect, provide main bonding jumper and neutral to ground bond connected to the building’s grounding system. Do not bond neutral to ground when there is a neutral to ground bond upstream from the same derived neutral system serving the disconnect switch.

I. Disconnect switches related to all smoke control fans shall have auxiliary contacts for fire alarm system monitoring of the position of the disconnect switch, coordinate with Division 28. Coordinate with fire detection and alarm contractor for the fire alarm and detection system to monitor all disconnect switches open/closed position that serve the smoke control system. All fire alarm and control wiring directly related to the monitoring of the supply power disconnect switches and control of the smoke control fans shall be installed in conduit.

3.2 TESTING

A. General: Before energizing, check for continuity of circuits and short circuits.

B. Provide thermal infrared scan of the enclosed switches rated 200 Amps or larger under full load prior to testing / maintenance and modifications and of the modified and new switchboard sections after construction as directed and witnessed by Owner. Make corrections as needed as soon as possible as directed by the Owner. Repeat the scan at the 11-month prior to closeout, and make corrections prior to closeout. Provide digital video documentation with test results for comparison between prior condition and post construction modifications and future tests.

END OF SECTION

SECTION 26 24 30

FUSES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Fuse work as shown and scheduled, and as specified.

B. Types: Fuses required for the project include the following:
1. 250 volt current limiting fuses
2. 600 volt current limiting fuses

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Provide products produced by Bussman or Littlefuse.

2.2 CURRENT LIMITING FUSES - 600 VOLTS AND LESS

A. General: Provide 200,000 amperes interrupting capacity (AIC) current-limiting fuses of the current ratings shown and voltage rating equal to or greater than the voltage at the point of application.

B. Types:
1. Fuses in circuits supplying individual motors, groups of motors, or loads including motors, 600 amperes or less, shall be UL Class RK1 or Class J, time delay fuses, Bussman LPS-RK (600V) LPJ-SP (600V), LPN-RK (250V).
2. Fuses in circuits supplying individual motors, groups of motors, or loads including motors, 601 to 4000 amperes, shall be UL Class L time delay fuses, Bussman KRPC "HI-CAP".
3. Fuses in circuits supplying other than motor loads, 600 amperes or less, shall be UL Class RK1, time delay fuses, Bussman LPS-RK (600V), LPN-RK (250V).
4. Fuses supplying surge protection devices (SPD) shall be surge rated for use with SPD devices.

2.3 SPARE FUSES

A. General: Provide spare fuses in the amount of 10% of each type and size installed, but not less than 3 spares of a specific size and type. Deliver to the Owner at the time of project acceptance. Fuses shall be encased in a labeled steel enclosure with padlock provision, to be wall mounted where directed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fuses in fuse holders immediately before energizing of the circuit where the fuses are installed. Fuses shall not be installed and shipped with equipment.

B. Labels: Place fuse identification labels, showing fuse size and type installed, inside the cover of each switch.

END OF SECTION

SECTION 26 27 73

LINE VOLTAGE WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide wiring device work as shown, scheduled, indicated, and specified. Low voltage and/or digital control switches required for lighting controls and lighting control systems shall be as specified and required for the low voltage and / or digital control lighting system. Refer to drawings or other specification sections for low voltage / digital lighting control systems. Cover plates for lighting control systems shall be as specified in this section unless specifically required otherwise by the low voltage / digital control device bulkhead or form factor.

1.2 QUALITY ASSURANCE

A. UL Label: Wiring devices shall be UL labeled.

B. NEMA Standard WD1 and WD6.

C. Fed. Spec. WC596, W-S-896

1.3 SUBMITTALS

A. Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect/Engineer/Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy of the specification section with the product data.

B. Submit a sample of each style and color of 120-Volt duplex receptacle and each 120/277- Volt switch with related cover plate. Attach plate to wiring device and label back side of plate with job description with permanent black marker.

C. Submit manufacturer's product data sheet for each style of device and plate on the project.

D. Submit drawings of plans, elevation and sections of receptacles and outlets in casework, cabinetwork and built-in place furniture. Coordinate dimensions with millwork shop drawings and related architectural drawing series.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Toggle switches, straight blade and twist lock devices, interior cover plates:
1. Leviton
2. Hubbell
3. Pass and Seymour
4. Eaton

B. Dimming
1. Lutron

2.2 WIRING DEVICE COLOR

A. Device color shall be verified with Owner/Architect except 20A, 125V receptacles and toggle wall switches which are directly supplied from an emergency source shall be red, and heavy duty 30 Amp and larger simplex devices which shall be black in color where the building standard color is not available. Provide equivalent hospital grade devices where red is not available in grade specified. Verify with Owner / Architect prior to submitting for approval. Color change kits as

required for dimming switches. Low voltage lighting control devices specified elsewhere shall match the line voltage wiring device color specified in this section.

2.3 RECEPTACLES

A. Industrial grade tamper resistant smooth face duplex receptacles, 2 pole, 3 wire grounding, with ground connection and poles internally connected to mounting yoke, with metal mounting straps, locking plug-tail or back and side wired with screw type terminals, NEMA indicated, (X=color designation).
1. 20A, 125V duplex NEMA #5-20R: Leviton #5362-SGX
2. 20A, 125V isolated ground duplex NEMA #5-20R: Leviton #5362-IGX
3. 20A, 125V ground fault circuit interruption (GFCI) NEMA #5-20R weather and tamper resistant: Leviton #G5362-WTX
4. 20A, 125V weather resistant (WR), tamper resistant: Leviton #TWR20-GY
5. 20A, 125V plug load control, split circuit marked for “controlled”, tamper resistant: Leviton #TDR20-S1G
6. 15A, with 20A feed-through, NEMA #5-15R, 125V duplex, arc fault (AFCI), tamper resistant: Leviton #AFTR1-HGX

B. Heavy-Duty Simplex: Single heavy-duty type receptacles, with green hexagonal equipment ground screw, with metal mounting straps, back or side wiring, black molded phenolic compound.
1. 15-60A, 125-250V, straight blade, NEMA configuration as indicated or as required by Owner.
2. 15-50A, 125-480V, twist lock, NEMA configuration as indicated or as required by Owner.

C. Hospital grade receptacles, 2 pole, 3 wire grounding, with ground connection and poles internally connected to mounting yoke, with metal mount straps, locking plug-tail or back and side wired with screw type terminals, molded phenolic compound, NEMA configuration indicated.
1. 20A, 125V grounded duplex NEMA #5-20R: Leviton #8300-X
2. 20A, 125V isolated ground duplex NEMA #5-20R: Leviton #8300-LIG (orange)
3. 20A, 125V ground fault circuit interruption (GFCI) with indicator light: Leviton NEMA 5-20R-8898-HGX
4. 20A/125V Tamper Resistant Duplex NEMA 5-20R: Leviton 8300-SGX

D. USB 2-port charger / tamper-resistant with 125-Volt receptacles:
1. USB type A/C, 1 type A and 1 type C port, 5.1A 5.0VDC charging. 20A, 125V, NEMA 5-20R: Leviton #T5833-HGX
2. USB A, 2 type A ports, 5.1A 5.0VDC charging. 20A, 125V, NEMA 5-20R: Leviton #T5832-HGX

E. USB 4-port charger:
1. USB type A+C, 2 type A ports and 2 type C ports. 5.0A 5.0VDC charging. Hubbell #USB4ACX.
2. USB type A, 4 type A ports. 5.0A 5.0VDC charging. Hubbell #USB4X.

2.4 WALL SWITCHES

A. Toggle: Industrial grade flush toggle switches, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, back and side-wired screw terminals.
1. Single-pole, 120/277V, 20A switch: Leviton #1221-2X
2. Double pole 120/277V, 20A switch: Leviton #1222-2X
3. Three-way, 120/277V, 20A switch: Leviton #1223-2X
4. Four-way, 120/277V, 20A switch: Leviton #1224-2G
5. Pilot light single-pole, 120/277V, 20A switch: Leviton #1221-PL
6. Momentary, 120/277V, 20A, single-pole double throw, center off: Hubbell only, #HBL 1557G

B. Toggle key operated switch (verify color and key type with Owner prior to construction).
1. Single-pole, 120/277V, 20A key operated switch: Hubbell HBL #1221GY
2. Two-pole, 120/277, 20A key operated, Hubbell HBL #1222GY
3. Three-way, 120/277V, 20A key operated switch: Hubbell HBL #1223GY
4. Four-way, 120/277V, 20A key operated switch: Hubbell HBL #1224GY

5. Momentary, single pole double throw, center off, 20A key switch: Hubbell #HBL 1557LG.
6. Key: Hubbell #HBL 1209. “h” type key switches shall be keyed alike to match the Owner’s standard key system. Coordinate with Owner.

2.5 WALL DIMMERS

A. Wall Box Dimmers: Self-contained, wall box mounted, linear slide square law dimmers with ON/OFF switch. Dimmers shall operate continuously at rated load in an ambient temperature up to 40°C and an input of 100 to 277V. Heat sink fins may be removed only as approved by Owner / Engineer for narrow ganging after applying de-rating.
1. Single-pole, 120/277V, 1000/2308 Watt incandescent / magnetic low voltage: Leviton #AWSMT-MBW.
2. Single-pole, 120/277V, 1500/3463 Watt incandescent / magnetic low voltage, 2-gang heat sink: Leviton #AWSMT-MCW.
3. Single-pole, 120/277V, 1920/4432-Watt LED / fluorescent 0-10V dc, 75 mA current sink: Leviton #AWSMT-7DW.
4. Three, four- or five-way remote switch: Leviton #AWSRT-00W.
5. Color change kit as required.

2.6 GFCI – GROUND FAULT CIRCUIT INTERRUPTER, BLANK FACE

A. 20A, 125V, GFCI, switch rated, blank face feed through, Hubbell #GFBF20GYL, gray finish, stainless steel cover plate black laser engraved with device protected, (example: DRINKING FOUNTAIN GFCI).

2.7 INTERIOR WALL COVER PLATES AND FASTENERS

A. Type 302 non-magnetic stainless-steel with satin finish (also required for wall box device cover plates for low voltage and digital lighting controls specified elsewhere).

B. Cover plate laser plate engraving for device identification (other than low voltage lighting controls).
1. Provide laser cover plate engraving with black filling for all wiring devices indicating panelboard name, circuit, and voltage.
2. Wiring devices connected to emergency/stand-by generator or inverter shall include the word “EMERGENCY”.
3. Text orientation shall be upright, readable from left to right when cover plate is installed.
4. Remotely located lighting switches shall also indicate the room or area and zone controlled by each switch. Coordinate specific wording with Owner/Architect.
5. Blank face GFCI cover plates shall also intuitively indicate the load or equipment served, device, or area protected downstream (“EDF” for drinking fountains, “RM RECEPTS”, “HOOD RECEPTS”, “VENDING”, “REFRIG”, etc.) For other loads, Owner/Architect shall determine name plate wording.

2.8 EXTERIOR COVER PLATES

A. Thomas & Betts CK Series, cast aluminum standard depth, locking mount, while-in-use, wet location, universal configuration.
1. Vertical mount receptacle: #CKSUV
2. Horizontal mount receptacle: #CKMU
3. Two-gang: #2CKU
4. 30-60 Amp Devices: #CKLSUV

2.9 CORD REELS AND DROP CORDS

A. Cord Reels:
1. Lighted cord reels: Industrial grade, LED hand Lamp only, 125V, 45-foot 16/3 SJEO cord, white finish, LED hand lamp. Hubbell #HBLI45163LED with #HBL340PB pivot base.
2. 20 Amp (2) duplex receptacle cord reels: Industrial grade, 125V, (2) 20A duplex receptacles, GFCI protection, 45-foot 12/3 SJO cord, white finish, yellow outlet box. Hubbell #HBLI45123GF220 with #HBLI340PB pivot base.
3. 30 Amp receptacle cord reels: Industrial grade, 125/250V, 30A, 45-foot 10/4 SJO cord, white finish, yellow outlet box. Hubbell #HBLI45104 with #HBLI340PB pivot base. 30 Amp NEMA receptacle termination as required by Owner.

4. 50 Amp receptacle cord reels: Industrial grade, NEMA 4 wet location, 600V, 55A, 50-foot 6/4 SOOW cord, yellow finish, self-retracting, with NEMA 50-Amp maximum receptacle termination as required by Owner. KH-Industries RTMH4L-WW-K6K.
5. Recessed enclosure for 20 and 30-Amp cord reels recessed above T-grid drop ceilings: Hubbell #HBLIPRBOX recessed cord reel enclosure, white finish, plenum rated.

B. Drop cord receptacles:
1. 20A, 125V, 25-feet 600 VAC, 3-conductor 12 AWG SOOW cable, twist lock plug, two 125V, 20A duplex WR GFCI outlets, safety yellow rubber outlet box, mesh strain relief cord grips. KH Industries #PP4DD-520-B12F-520.
2. 20A, 125/250V, 25-feet 600 VAC, 4-conductor 12AWG SOOW cable, twist lock plug, four 125/250V NEMA L1420P outlets, safety yellow rubber outlet box, mesh strain relief cord grips. KH Industries #PP7DD-520-B12F-L1420.
3. 30-60 Amp, voltage, NEMA plug/receptacle as required by Owner, SOOW cable, number of conductors and length as required, mesh strain relief cord grips.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cover plates for receptacles and toggle switches shall be of the same manufacturer throughout unless otherwise noted.
1. Key switches and keys shall be as specified and also as approved by Owner.
2. Submit samples for each specified toggle switch and duplex receptacle color to Architect.

B. Install wiring devices where shown and as required, in accordance with manufacturer's written instructions, requirements of NEC, and in accordance with industry practices. Do not install devices until wall construction and wiring is completed.

C. Install receptacles and switches only in electrical boxes that are clean, free from building materials, debris, and similar matter.

D. Install wiring devices plumb and aligned in the plane of the wall, floor, ceiling or equipment rack.

E. Install switches in boxes on the strike side of doors as hung. Install so the up position will close the circuit or will be the highest level of illumination. Where more than one switch is in the same location, install switches in a multi-gang box with a single cover plate.

F. Provide a cover plate for every wiring device and blank cover plates for unused rough-in-only boxes that matches the building standard. Fasten all plates outdoors with type 302 Allen Head "tamper-proof" screws.

G. Mounting heights of all wiring devices shall comply with local accessibility standards and local codes, except where wiring devices are indicated for special purpose and access is only required by maintenance or service personnel.

H. Refer to Architectural drawing and elevations, etc. for exact location of wiring devices. Coordinate location of all wiring devices with other trades, specialty items, and millwork and resolve all conflicts prior to rough-in. Field coordinate exact mounting location with all trades to avoid and resolve conflicts during construction.

I. Locate receptacles for electric drinking fountains/coolers and bottle fill stations below equipment so that the receptacle is accessible and concealed as much as practical from public view by the equipment open cowling so that the receptacle remain readily accessible. For dual level basin equipment, locate receptacle under the upper basin.

J. Provide convenience outlet receptacle within 25-feet of all new electrically operated mechanical equipment.

K. Where exterior receptacles are intended for continuous use, mount in horizontal position with while in use cover plate. (Exterior electric drinking fountains, ice makers, ice storage bins, landscape lighting low voltage transformers, seasonal decorative lighting, etc.)

L. Install wall box dimmers to achieve full rating specified after de-rating for ganging as recommended by manufacturer.

M. Do not share neutral conductor on load side of dimming switches.

N. Install receptacles with grounding pole down, except in any of the following conditions where the grounding pole shall be installed in the up position: healthcare occupancies, if required by local AHJ, if required by Owner's construction standards or if directed by Owner or Architect. If installed horizontally, install with neutral pole on top.

O. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

P. Provide pigtail to each receptacle and each switch. Neutral and phase conductors shall be installed using side or rear entry lugs only. Do not wrap conductors around screw terminals. Tighten all screws and lugs as recommended by manufacturer.

Q. All receptacles and switches shall have a minimum of two wraps of Scotch 33 or equivalent tape around terminal screws.

R. Provide toggle switch within sight of all trap primers, circulation pumps, 120-Volt motors and motorized equipment to serve as the equipment disconnect switch.

S. Mount cord reels and cord reel recessed enclosures to structure with galvanized steel struts and as recommended by manufacturer. Field verify exact location of cord reels with Owner/Architect. Mounting location shall avoid conflicts with piping, light fixtures and ductwork, etc. when cord reel is extended and retracted. Set ball stop as directed by Owner / Architect. Provide hand lamp only type cord reels in commercial / educational automotive garages with classified (hazardous) locations. Provide local toggle switch at standard switch height for hand lamp only cord reels.

T. Mount drop cord suspension hook or j-box to structure to support the cord's weight and additional normal use pulling tension and as recommended by manufacturer. Use cable grips, either with cord grip hanging hook at open ceilings or with chrome plated escutcheon cover plate mounted to recessed j-box at finished ceilings. Field verify exact location, drop height, and NEMA outlet configuration of drop cords with Owner/Architect. Provide weatherproof receptacle cap or covers if located in wet location. Mounting location shall avoid conflicts with piping, light fixtures and ductwork, etc.

3.2 GROUND FAULT PROTECTION FOR PERSONELL

A. When GFCI personnel protection receptacles are not commercially available or cannot be installed at a readily accessible location or indicated otherwise on the drawings, GFCI personnel protection shall be provided by a remote blank face GFCI wiring device or by an up-stream GFCI receptacle that also provides downstream GFCI protection and located in a readily accessible location. When branch circuit breaker device with integral GFCI protection is required or specified, it shall be within the manufacture's recommended distance limitations of the connected receptacle(s) or load(s) for proper GFCI personnel protection at the farthest outlet.

B. GFCI personal protection locations include but are not limited to the following:
   1. For other than dwelling units: All single phase 125-250-Volt (150-Volts to ground or less) receptacles 50-Amperes or less, and all three phase 125-250-Volt (150-Volts to ground or less) receptacles 100-Ampres or less in the locations indicated below.
   2. Dwelling units: All single phase 125-250-Volt receptacles installed in the following locations indicated below.
   3. Provide personnel GFCI protection as indicated above in the following locations and all additional locations as required by the NEC.
      a. Outdoors (with exceptions for not readily accessible receptacles with dedicated branch circuits for snow melting, deicing, pipeline/vessel heat receptacles. Provide these loads with 30mA EGFI circuit breaker protection).
      b. Bathrooms/toilets/restrooms
      c. Janitors/custodial closets and mop sinks.
      d. Laundry areas
      e. Parking structures, service garages, garages and accessory buildings

f. Basements, crawl spaces (including 120-Volt lighting)
g. Within 6-feet of all water sources including sinks, mop-sinks, lavatories, bathtubs, shower stalls, faucets, eye wash stations, emergency shower stations
h. Indoor damp and wet locations
i. Locker rooms
j. Indoor swimming pools and natatoriums areas and adjacent corridor/hall convenience receptacle outlets located within 25-feet of all access doors.
k. Non-dwelling unit therapeutic tubs/pools/whirlpool areas and adjacent corridor/hall convenience receptacle outlets located within 25-feet of all access doors.
l. Receptacles serving dwelling unit kitchen counter tops
m. Vending machines
n. Elevators, dumb waiters, escalators, moving sidewalks: receptacles in pits, hoist ways, well ways or those mounted on the cars of elevators and dumb waiters.
o. Electric vehicle charging equipment.
p. All receptacles serving kitchen or food preparation counter tops.
q. Automotive vacuum machines
r. Drinking water fountains/coolers and bottle fill stations
s. Corded high-pressure spray washing machines
t. Tire inflation machines
u. Dish washers
v. Receptacles at end of cord reels or drop cords.
w. Boat houses, boat hoist, and all pier/dock receptacles and lighting (excludes shore power that requires GFPE).
x. Central plant, mechanical rooms and electrical rooms
y. Wood, metal, or other material fabrication or vocational training shops.
z. Receptacles that serve educational science and science prep room counter tops.

C. Where a GFCI protected receptacle outlet is required or indicated behind vending machine, refrigerators or other equipment, provide remote GFCI blank face in same room as protected receptacle and at a readily accessible location with standard receptacle outlet behind equipment. Refrigerators shall be GFCI protected only where located within 6-feet of power cord distance from the edge of a sink to the surface of the refrigerator.

D. Unless indicated otherwise, locate blank face GFCI device near light switches at same height as light switches or ganged with the light switch. Provide GFCI protection for all receptacle outlets located below 42-inches in all infant through 2-year old day care and similar areas designated for occupancy by infant through 2-year old day care occupants so the GFCI device can easily be intentionally tripped or tested and reset.

E. Provide branch circuit breaker 30mA (EDP) or 100mA (EPE) equipment protection for utilization equipment as required by the NEC and where indicated on the drawings.

3.3 TESTING

A. Before energizing, check for continuity of circuits, short circuits, and grounding connections.

B. After energizing, check wiring devices to demonstrate proper operation and receptacles for correct polarization, voltage and phase orientation if intended 3-phase equipment is phase orientation dependent for proper motor rotation or operation.

C. Test each individual GFCI receptacle and all downstream receptacles protected by an upstream GFCI device with simulated ground fault tester, make corrections as necessary.

D. Operate each wall switch with circuit energized and verify proper operation.

END OF SECTION

SECTION 26 36 00

NEW AUTOMATIC TRANSFER SWITCHES
(Connected to Existing Emergency Generator)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Conditions of the Contract and applicable requirements of Division 1 and Section 26 05 00 govern this Section.

1.2 WORK INCLUDED

A. Furnish and install new automatic transfer switches, complete with wiring and controls as shown on the drawings and as specified herein.

1.3 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Onan/Cummins/Southern Plains Power. Match existing manufacturer.

B. NEC and NFPA Compliance: Comply with applicable portions of the NEC (NFPA 70) including, but not limited to, emergency and standby power generation systems (NFPA 99 & 110).

C. IEEE Compliance: Comply with applicable Institute of Electrical and Electronics Engineers, Inc. (IEEE) standards pertaining to automatic transfer switches.

D. Supplier: Authorized distributor of specified manufacturer with minimum three years documented experience.

1.4 AUTOMATIC TRANSFER SWITCH WARRANTY

A. Provide two-year parts and labor warranty from date of substantial completion. Provide an additional three year parts warranty after the second year.

1.5 SUBMITTALS

A. Submit manufacturer’s certified computer generated performance and capacity data in accordance with specification requirements.

B. Submit manufacturer’s Installation, Start-Up and Service instructions.
   1. Recommended conductors, overcurrent protection and disconnect size.
   2. Electrical interlocks.

C. Submit recommended clearance dimensions.

D. Submit internal wiring diagram of Control Center.

E. Submit sequence of operation in narrative form.

PART 2 - PRODUCTS

2.1 AUTOMATIC STARTING SEQUENCE OF EVENTS

A. Sequence of Events:
   1. Upon drop in normal source voltage to 65 to 70% of rated voltage, or upon failure of the normal source of electrical supply, the engine shall be automatically cranked and brought up to the full operating speed.
   2. The cranking motor circuit shall be instantly broken when the engine starts.
   3. Within 10 seconds the generator shall be brought up to operating speed; the generator voltage shall operate the automatic transfer switch, disconnecting the load from the normal source of supply and connecting the emergency power to the load.
   4. Upon restoration of the normal source voltage to 92 to 95% of rated voltage or restoration of normal source of supply, the sequence shall be reversed, restoring the transfer switch to the automatic normal operating position, disconnecting the load from the emergency generator and reconnecting the load to the normal source of supply. The emergency generator set will continue to operate for a period of from 1 to 5 minutes after the restoration of the normal source of supply. Should the engine fail to start upon the first crank, there shall be two additional cranking attempts made with a 15 second rest between cranks, after which the cranking cycle shall cease and an alarm shall sound to indicate malfunctioning of the system.

B. Instruction Data and Drawings: Commercial type operating instructions shall be provided consisting of operating and maintenance manuals, parts books, dimensional drawings and wiring diagrams. Three copies of dimensional drawings and wiring diagrams shall be provided as specified.
   1. Operating Instructions: Provide and install in a suitable enclosure operating instructions for the automatic transfer switch.

2.2 AUTOMATIC TRANSFER SWITCHES

A. Rating and Construction:
   1. Refer to the project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, voltage and ampere ratings, and accessories. All transfer switches have switched neutrals and shall be electrically operated and mechanically held.
   2. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008, and CSA Approved, and comply with NEMA ICS 2-447. When protected by molded case breaker withstand and closing ratings shall not be less than the following RMS symmetrical amps at 600 VAC:

Switch Size in Amps	WCR @ 480 Volts
Up to 125	22,000
150 to 260	30,000
300 to 400	65,000
600 to 800	65,000
1000 to 1200	100,000
1600 and larger	100,000

   3. Provide one of the following standard products:
      a. Onan OTEC or OTPC Series as required
      b. Standby Generator System Manufacturer, provided as a complete system
      c. ASCO 300 Series
      d. Russelectric RMT/RMTD Series
      e. Zenith ZTSD Series
   4. Electrical operation shall be accomplished by a momentarily energized single solenoid operating mechanism, which receives power from the source to which the

load is being transferred. Fuse or thermal protection of the main operator is prohibited. The operating transfer time shall be 1/6 of a second or less. Mechanical locking in each position shall be accomplished without the aid of permanent magnets, latching solenoid, or motor operators.

5. Operation shall be inherently double-throw whereby all contacts move simultaneously and with no programmed delay in a neutral position. Electrical spacing shall be equal to or exceed those listed in table 15.1 of UL 1008. Only those main contact structures specifically manufactured for transfer switch service shall be acceptable. An overload or short circuit shall not cause the switch to go to a neutral position.
6. Inspection of all contacts (movable and stationary) shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The maintenance handle shall permit the operator to stop the contacts at any point throughout the entire travel to properly inspect and service the contacts when required.
7. All switches shall have fully rated neutral transfer contacts that momentarily interconnect the neutrals of the sources and load for 100 milliseconds maximum, during the transfer / retransfer operation. The neutrals shall remain so interconnected until the line contacts close on the alternate source. Line and neutral contacts shall be driven by a single main operator.
8. Enclosure shall be NEMA Type 12, indoor use, dust tight and drip-tight.

B. Controls and Accessories:

1. Controls shall provide for the automatic starting sequence of the generator set.
2. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensors. Solid-state time delay start, adjustable from 0 to 5 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts factory wired to a field wiring terminal block.
3. The switch shall transfer when the emergency source reaches the set point voltage and frequency. Provide a solid-state time delay on transfer, adjustable from 0 to 120 seconds.
4. The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 0 to 30 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.
5. Control shall be solid state and designed for a high level of immunity to power line surges and transients, demonstrated by test to IEEE Standard 587-1980. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs. Control shall be quick-disconnect for ease of service.
6. Automatic transfer switches shall have inherent phase balance protection logic to detect a ‘single phasing’ Solid state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and dropout settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage. The transfer switch controller shall be equipped with a fault output terminal interconnected to a 24Vdc shunt trip, integral to the transfer switch and with built-in time delay, that functions to disconnect the utility source from the load should the standby emergency source fail to start.
7. Controls shall signal the engine-generator set to stop after a time delay, adjustable from 0 to 10 minutes, beginning on return to the normal source.
8. Power for transfer operation shall be from the source to which the load is being transferred.
9. The control shall include latching diagnostic indicators to pinpoint the last

successful step in the sequence of control functions, and to indicate the present status of the control functions in real time.

10. The control shall include provisions for remote transfer inhibit and area protection.
11. Provide front panel devices mounted on cabinet front consisting of:
    a. A key operated selector switch to provide the following positions and functions:
        1) Test - Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer. Refer to Part 3 for programming requirements.
        2) Normal - Normal operating position.
        3) Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.
12. Exerciser Clock: Provide solid state exerciser clock to set the day, time, and duration of generator set exercise/test period. Provide a with/without load selector switch for the exercise period. Refer to Part 3 for programming requirements.
13. Provide Phase Sequence Monitor/Balance Module to protect against inadvertent phase rotation hookup and monitor for voltage phase imbalance between phases.
14. Submittals:
    a. Submittal drawings and information on the transfer switches including installation drawings, wiring diagrams, dimensions, weights, etc. shall be provided. Full descriptive information on accessory items shall be furnished. All submittals shall be reviewed by the Engineer and approved prior to fabrication.
15. Instruction Data and Drawings:
    a. Commercial type operating instructions shall be provided consisting of operating and maintenance manuals, parts books, dimensional drawings and wiring diagrams. Three copies of each are to be furnished per Contract Closeout specifications.
    b. Operating Instructions: Provide and install in a plexiglass enclosure complete operating instructions for each type of transfer switch.

2.3 ELECTRICAL AND MECHANICAL PERFORMANCE

A. The switch must comply with UL 1008 and NEMA Standard Publication ICS 2-447. In addition, the switch must meet or exceed the following requirements and if so requested, be verified by certified laboratory test report.
    1. Temperature Rise: Measurements shall be made after the overload and the endurance tests.
    2. Withstand: UL listed to withstand the magnitude of fault current available at the switch terminals when coordinated with respective protective devices at an X/R ratio of 6.6 or less. The main contacts of the transfer switch shall not trip open or weld when subjected to fault currents.
    3. Dielectric: Test, following the withstand current rating test, at 1960 volts AC rms minimum.
    4. Transient Withstandability: Control panel voltage surge withstand capability test per IEEE Standard 472-1974 and voltage impulse withstand test per NEMA Standard publication ICS-1-109.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install automatic transfer switch where shown, in accordance with the equipment manufacturer's written instructions and recognized industry practices, to ensure that the automatic transfer switch complies with the specified requirements and serve the intended purposes.

B. Standard: Comply with NEMA standards, requirements of the NEC, and applicable portions of NECA Standard of Installation pertaining to installation of standby engine-driven generator sets and accessories.

C. Options and Accessories: Provide circuits, conductors, and raceways as required for options and accessories as specified.

D. Provide dry contacts and outputs to monitor transfer switch and generator alarm conditions and notify Owner’s Police or security personnel, and building management controls system and personnel, both when transfer to emergency occurs and when transfer to normal occurs.

3.2 GROUNDING

A. Install the generator automatic transfer switch as a non-separately derived system. Do not ground the generator neutral to the generator frame. Ground the generator frame to the building grounding system.

3.3 CONTROLS

A. Provide generator start-up control wiring and raceway from each automatic transfer switch to the respective standby generator set as required.

3.4 TESTING

A. Provide testing in accordance with NFPA 110. Provide manufacturer’s start-up service to test emergency power system to demonstrate standby capability and compliance with specified requirements, including automatic start-up, controls and full load acceptance. Test shall include operation of standby power system with voltage check while the system is loaded to ensure proper operation of the emergency generator, transfer switches, and other system components. Operation of the system shall simulate standby power conditions, that is, loss of main electrical power to the building. Test period shall be trouble-free operation with at least four automatic transfer switch operations (each switch) within the period of operation.
   1. The generator shall be started cold and run for a four-hour test with building load connected and load bank to achieve 90 percent of rated generator capacity. Monitor and record available natural gas pressure and verify supply is adequate and stable during the entire test.
   3. Retransfer the load after test.
   4. After this test, the set shall cool for five minutes, then must start and carry 90% rated capacity load for four hours.
   5. Provide additional Owner witnessed testing for all ancillary equipment on generator. Demonstrate all specified functions and alarms.
   6. Demonstrate the cranking cycle and all engine safety devices. The Owner's authorized representative shall be instructed in the operation and maintenance of the unit. Provide minimum 4-hours training at each campus for 4-persons; one hour on four separate days

B. Provide separate written inspection report by manufacturer’s factory representative regarding existing condition and/or deficiencies regarding the existing diesel generator operation.

C. Contractor shall furnish all instruments and personnel required for test. Submit 4 copies of certified test results to Architect/Engineer for review. Test reports shall include date and time of test, relative humidity, temperature and weather conditions.

D. Upon completion of all tests, Contractor shall notify the Owner / Architect in writing the fuel level of the existing fuel tank if generator is fueled by diesel.

3.5 MISCELLANEOUS

A. Provide circuits and receptacles to serve loads as directed by Owner / Architect, including, but not limited to:
1. Telecommunications equipment
2. Public Address Communication & Master Clock System
3. Fire Alarm, Detection and Signaling Systems
4. Security Systems (except for battery powered access control door hardware)
5. Video Surveillance CCTV System including remote camera power supplies
6. Technology/Computer data MDF/IDF equipment
7. MDF/IDF dedicated HVAC equipment
8. Selected refrigeration equipment
9. Clinic refrigerator and selected clinic receptacles
10. Building Access control System including remote power supplies, except do not power door electric strike or hinge hardware on emergency power.
11. Owner’s Radio Base Station / Radio Repeaters / Distributive Antennae System (DAS)
12. Elevator
13. Point of Sale Stations
14. Kitchen Manager’s Work Station
15. Building Management and Control System (BMCS)
16. Special education receptacles, one in each room.
17. First responder Bi-Directional Distributive Antennae System (DAS) Systems

3.6 PROGRAMMING

A. Program automatic transfer switches for delayed transfer to emergency and sequential operation to transfer loads by priority based on manufacturer recommendation or as indicated below:
1. Life Safety Loads – less than 10 seconds
2. Critical Loads – more than 15 seconds, less than 30 seconds
3. Equipment Loads – more than 40 seconds, less than 60 seconds
4. Non-Legally required loads – more than 75 seconds, less than 120 seconds

B. Program automatic transfer switch voltage and frequency pick-up and drop out for load shedding based on load priority for voltage and frequency based on manufacturer recommendations or as indicated below:
1. Life Safety pick-up 10%; drop out 20%
2. Critical Loads pick-up 10%; drop out 15%
3. Equipment Loads pick-up 8%; drop out 15%
4. Non-Legally required loads pick-up 5%; drop out 10%

C. Exerciser clock (if this transfer switch is the transfer switch to exercise the generator): Program automatic transfer switch exerciser clock for generator to run every Tuesday, 8:00 AM, for 30-miniute run time, without load. Verify with Owner.

D. Test switch: Program automatic transfer test switch for generator to run with load, for

maximum 30-miniute test time plus cool-down. Verify with Owner.

3.7 TRAINING

A. Provide 2 hours training, one hour each for four persons, four separate days.

END OF SECTION

SECTION 26 41 13

LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section specifies the lightning protection system for the building(s) or structure(s). This system provides safety for the building and occupants by preventing damage to the structure caused by lightning. The design of this system is to be in strict accordance with this section of the specification and all contract drawings that apply.

B. The work covered under this section of the specifications consists of furnishing labor, materials and services required for the completion of a functional and unobtrusive lightning protection system.

C. A firm actively engaged in the installation of certified lightning protection systems and listed with Underwriters' Laboratories, Inc. and the Lightning Protection Institute shall install the system.

1.2 STANDARDS

A. The entire lightning protection system shall be designed and installed in accordance with:
1. National Fire Protection Assoc. (NFPA) Document # 780
2. Underwriters' Laboratories, Inc. (UL) Standard # 96A
3. Lightning Protection Institute (LPI) Standard # 175
4. National Electrical Code (NEC)

1.3 SYSTEM DESIGN

A. The work covered under this section of the specifications consists of furnishing labor, materials and services required for the completion of a functional and inconspicuous lightning protection system approved by the Architect and Owner. The design of this system is to be in strict accordance with this section of the specifications and all contract drawings that apply.

B. If any departure from the contract drawings or submittal drawings covered below are deemed necessary by the Contractor, details of such departures and reasons therefore shall be submitted as soon as practical to the architect and engineer for approval.

1.4 QUALITY ASSURANCE

A. The contractor shall furnish a UL Master Label or Letter of Findings upon completion of the installation.

B. The system installation shall be made under the supervision of an LPI Certified Master Installer, and the LPI System Certification shall be delivered upon completion of the installation.

C. The installation shall comply with the requirements of NFPA 780, UL 96A, and LPI 175.

D. The installing lightning protection contractor company shall be listed with the Lightning Protection Institute, and Underwriters' Laboratories, Inc. The installation contractor shall have personnel on staff Certified by the LPI as a Master Installer or Master Designer of lightning protection systems.

E. LPI qualified staff shall provide supervision of the installation to the Standards.

1.5 SUBMITTALS

A. Specification Compliance Review: Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect/Engineer/Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy with the product data.

B. Complete design submittal drawings showing the type, size, and location of all grounding, roof conductors, down conductors, through-roof connectors and air terminals, and shop drawings shall be submitted to the architect and engineer for approval prior to the commencement of work.

C. Product Data: Provide dimensions and materials of each component, and include indication of listing in accordance with UL 96 and LPI 175 standards.

D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

E. Submit certificate of compliance from Underwriters' Laboratories and Lightning Protection Institute indicating approval of lightning protection systems.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation.

G. A complete shop drawing shall be submitted to the architect and engineer for review prior to commencement of the installation. The shop drawing shall show the extent of the system layout designed for the structure along with details of the products to be used in the installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Only firms regularly engaged in the manufacture of lightning protection system components whose products have been in satisfactory use in similar service for not less than 5 years shall be used.
1. Beijing Arrow Advanced Technology Co., Ltd.
2. East Coast Lightning Equipment, Inc.
3. ERICO, Inc.
4. Harger, Inc.
5. Heary Brothers Lightning Protection Co., Inc.
6. Independent Protection Company, Inc.
7. Preferred Lightning Protection
8. Robbins Lightning, Inc.
9. Thompson Lightning Protection, Inc.
10. Cooper Power Systems
11. Advanced Lightning Protection Technology, Ltd.

2.2 PRODUCTS

A. All materials shall comply in weight, size, and composition with the requirements of the UL 96 Materials Standards. All equipment shall be UL listed and properly labeled. The system furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of lightning protection equipment and a member of LPI.

B. Equipment shall be the manufacturer's latest approved design of construction to suit the application where it is to be used in accordance with accepted industry standards and with NFPA, LPI, & UL requirements.

2.3 MATERIALS

A. Class I materials shall be used for systems on structures not exceeding 75 feet in height and Class II materials shall be used for systems on structures exceeding 75 feet above grade.

B. Copper shall be of the grade ordinarily required for commercial electrical work, generally designated as being 95 percent conductive when annealed. Aluminum conductors shall be of electrical grade aluminum alloy.

C. Lightning protection materials shall be coordinated with building construction materials to assure compatibility. Aluminum lightning protection materials shall not be embedded in concrete or masonry, installed on or below copper surfaces, or used for the in-ground system. Copper lightning protection materials shall not be installed on aluminum surfaces. Copper system components within 2 feet of chimney exhausts shall be tin coated to protect against deterioration.

D. Strike termination devices shall be provided to place the entire structure under a zone of protection as defined by the Standards. Air terminals shall project a minimum of 10 inches above protected areas or objects. Air terminals shall be located within 2 feet of exposed corners and roof edges.

E. Metallic bodies having a thickness 3/16" or greater may serve as strike termination devices without the addition of air terminals. These bodies shall be made a part of the lightning protection system by connection(s) according to the Standards using main size conductors and bonding fittings with 3 square inches of surface contact area.

F. Cable conductors shall provide a two-way path from strike termination devices horizontally and downward to connections with the ground system. Cable conductors shall be free of excessive splices and sharp bends. No bend of a conductor shall form a final included angle of less than 90 degrees nor have a radius of bend less than 8 inches. Structural elements and design features shall be used whenever possible to minimize the visual impact of exposed conductors.

G. Cable down conductors shall be concealed within the building construction. At existing structures, cable down conductors may be enclosed within PVC conduit from roof to grade level and exact locations shall be coordinated with the Architect to minimize visual impact of exposed down conductors. Down conductors shall be spaced at intervals averaging not more than 100 feet around the protected perimeter of the structure. In no case shall any structure have fewer than two down conductors. Where down conductors are exposed to environmental hazards at grade level, schedule 80 PVC conduit shall be used to protect the conductor to a point eight feet above grade.

H. In the case of structural steel frame construction, cable down conductors shall be omitted and roof conductors shall be connected to the structural steel frame at intervals averaging not more than 100 feet around the protected perimeter of the structure.

I. Exposed cable conductors shall be secured to the structure at intervals not exceeding 3 feet – 0 inches. Fasteners, nails, screws, or bolts shall be of suitable configuration for the intended application and of the same material as the conductor or of electrolytically compatible materials. Galvanized or plated steels are not acceptable.

J. Connectors and splicers shall be of suitable configuration and type for the intended application and of the same material as the conductors or of electrolytically compatible materials.

K. Ground terminations suitable for the soil conditions shall be provided for each downlead conductor. Where the structural steel framework is utilized as main conductors for the system, perimeter columns shall be connected to the grounding system at intervals averaging 60 feet or less on the protected perimeter. For any structure in excess of 60 ft. in vertical elevation above grade, a ground ring interconnecting all ground terminals and other building grounded systems shall be provided. Refer to the electrical grounding specifications for additional information.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation of the lightning protection system components shall be performed in a neat and workmanlike manner.

B. Roof penetrations required for down conductors or for connections to structural steel framework shall be made using through-roof assemblies with solid bars and appropriate roof flashings. The roofing contractor shall furnish the methods and materials required at roofing penetrations of the lightning protection components and any additional roofing materials or preparations required by the roofing manufacturer for lightning conductor runs to assure compatibility with the warranty for the roof. The roofing contractor shall be responsible for sealing and flashing all lightning protection roof penetrations as per the roof manufacturer’s recommendations. Refer to the roofing specifications for the lightning protection roof penetrations and/or method of conductor attachment.

C. LPI certification requires a signature by a representative of the owner at three stages of installation – the in-ground system, the concealed portion of the work, and the exposed or roof level section. UL certification requires inspection by their third-party field staff after completion of the installation. Upon completion of the lightning protection installation, the installing contractor shall provide to the Owner an as-built drawing of the system, along with copies of the UL and LPI Certificates of completion.

D. If the protected structure is an addition to or is attached to an existing structure that does not have a lightning protection system, the contractor shall certify that the system installed complies with the requirements of the Standards, and advise the owner of the lightning protection work required on the existing structure to obtain full certification for the structure. If the existing structure does have a lightning protection system, the contractor shall advise the owner of any additional work required on the existing system to bring it into compliance with current Standards and thus qualify for UL and LPI certification.

END OF SECTION

SECTION 26 43 00

SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Surge Protection Device (SPD) covered under this section includes service entrance type surge protection devices suitable for use as Type 1 or Type 2 Devices per UL1449 5th Edition, applied to the line or load side of the utility feed inside the facility. SPDs shall be connected in parallel with the facility's wiring system. The unit shall be manufactured in the USA by a qualified manufacturer of suppression filter system equipment, which has been engaged in the commercial design and manufacture of such products for a minimum of five years.

B. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified and required to finish and install surge protection devices.

1.2 QUALITY ASSURANCE

A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:
1. UL 1449 Fifth Edition
2. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
3. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
4. IEEE 1100 Emerald Book.
5. National Fire Protection Association (NFPA 70 (NEC), 75, and 78).
6. UL 1283 – Electromagnetic Interference Filters

B. When requested for verification, provide copies of the following:
1. Copies of actual let through voltage data in the form of oscilloscope results for both ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (Ring wave) tested in accordance with ANSI/IEEE C6245.
2. Copies of test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor components can survive published surge current rating on both a per mode and per phase basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable.

1.3 SUBMITTALS

A. Submit shop drawings complete with all technical information for specific unit dimensions, let through voltage data, detailed installation instructions, maintenance manual, and wiring configuration.

B. Provide detailed marked-up copy of this specification with line-by-line compliance or exception statements to all provisions of this specification.

C. Copies of Manufacturer’s catalog data, technical information and specifications on equipment.

D. Copies of documentation stating that the Surge Protection Device is listed from a Nationally Recognized Testing Laboratory (NRTL) (UL, ETL, etc.) and are tested and multi-listed to UL 1449 5th Edition and UL 1283.

F. Copy of warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.

1.4 WARRANTY

A. The manufacturer shall provide a minimum 20-year warranty for high and very high exposure SPDs. Very high exposure unit warranties shall include exposure to temporary extended over-voltage conditions. Provide a minimum 15-year warranty for all medium exposure SPDs, and a minimum 10-year warranty for all other SPDs for parts from date of substantial completion against failure. Contractor shall assist the Owner with manufacturer warranty registration.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURER

A. Low exposure, minimum 10-year parts warranty, minimum 50k Amps per mode, 100k Amps per phase, Type 1 and Type 2.
   1. Recessed mount panelboard extension with brushed stainless-steel front:
      a. ACT Communications:471- ###V-050-SS-F-PB flush series.
      b. ABB Current Technology PX3-050-VVV- #X-SF-X-F- # series.
      c. SST Southern Tier Technologies T45-VVVV-50-AWAJ2-C-RKSS (stainless steel front).
   2. Branch panelboard surface mounted:
      a. ACT Communications 455 series.
      b. ABB Current Technology CG3 60 series.
      c. SST Southern Tier Technologies T45-VVVV-50AWAJ2-C

B. Medium exposure, minimum 15-year parts warranty, minimum 120k Amps per mode, 240k Amps per phase, Type 2.
   1. ACT Communications 471 series.
   2. ABB Current Technology CGP3 125 series.
   3. SST Southern Tier Technologies T45-VVVV-120A series

C. High exposure, minimum 20-year parts warranty, minimum 200k Amps per mode, 400k Amps per phase, Type 2 SPD.
   1. ACT Communications 471 x200 series.
   2. ABB Current Technology TG3 200 series.
   3. SST Southern Tier Technologies T45-VVVV-200A series

D. Very high exposure at service entrance 1,201 Amps and above: Minimum 20-year parts warranty; minimum 300k Amps per mode; 600k Amps per phase, Type 1 and 2 SPD:
   1. ACT Communications 471 x300 SEL series.
   2. ABB Current Technology SEL3 300 series.

   The service entrance protector shall incorporate a combination of TPMOV and Selenium technology allowing for transient surge and temporary over voltage protection. The unit shall be able to prevent common temporary over voltages and high impedance faults from damaging the MOVs, increasing their longevity and ability to protect the critical load. Limited and Intermediate current TOVs can be caused by a

loss of the neutral conductor in a split phase or three phase power system. The available fault current will be determined by the impedance of the loads connected to the phases opposite the SPD and are typically in the range of 30A to 1000A. Minimum 20-year parts warranty, extended over-voltage protection, minimum 200k Amps per mode, 400k Amps per phase, Type 2 SPD. The Selenium elements must limit voltage to the MOV as a percent of nominal as outlined below:

Overvoltage seen by MOVs as % of Nominal				
	available current			
time	30A	100A	500A	1000A
1 cycle	120%	130%	150%	160%
10 cycles	130%	150%	160%	160%
30 cycles	140%	150%	160%	160%

*To verify damage to the MOVs has been mitigated, the percent overvoltage seen at the MOV must be less than 200% for split-phase applications or 173% for three-phase applications (100% is nominal).

2.2 MANUFACTURED UNITS / ELECTRICAL REQUIREMENTS

A. Declared Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of the nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL1449, section 37.7.3. MCOV values claimed based on the component's value or on the 30-minute 115% overvoltage test in UL1449 will not be accepted.

B. Unit shall have not more than 10% deterioration or degradation of the UL1449, Voltage Protection Rating (VPR) due to repeated surges.

C. Protection Modes SVR (6kV, 500A) and UL1449 VPR (6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120), (600Y/347). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449: Values Depicted are based on a system Without Disconnect / With Disconnect

System Voltage	Mode	MCOV	UL 1449 VPR Rating
120/240	L-N	150	700/1200
120/208	L-G	150	700/1200
	N-G	0	900/1200
	L-L	300	1000/1200
277/480	L-N	320	1000/1200
	L-G	320	1200/1200
	N-G	0	1200/1500
	L-L	550	1800/1800

D. Electrical Noise Filter- each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric noise shall be as follows using the MIL-STD-220A insertion loss test method.
1. 14 dB from 10 kHz to 1 MHz.

E. Each Unit shall provide the following features:
1. Phase Indicator lights easily visible in high ambient light conditions, Form C dry contacts, counter and audible alarm.
2. Field testable while installed.
3. High performance interconnecting cable for hard wired non-pigtail units.

4. The UL 1449 Voltage Protection Rating (VPR) shall be permanently affixed to the SPD unit.
5. The UL 1449 Nominal Discharge Surge Current Rating shall be 20kA
6. The SCCR rating of the SPD shall be 200kAIC without requiring an upstream protection device for safe operation.
7. The unit shall be listed as a Type 2 SPD per UL1449.
8. Power wiring: SPD shall be equipped for hard wiring and shall have mechanical lugs that can accept up to #2 AWG wire on High and Very High Exposure units and up to #6 on Medium and Low Exposure units.

2.3 POWER CABLES FOR CONNECTION

A. Power wiring: Conductors between all high and very-high SPDs and switchgear shall be high performance interconnect system “Low Z Cable” cables with Ultra Low impedance characteristics at 10kHz and above.

B. High Performance Low Impedance cable for hard wired SPDs shall be #6 AWG minimum for Very High, High, and Medium Exposure SPDs and #10 AWG minimum for Low Exposure SPDs. Low exposure pig tail units shall utilize the factory provided cables, cut to shortest and straightest run, without splices, wiring through conduit nipple only.

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION

A. The unit shall be installed as close as practical to the facility's wiring system in accordance with applicable national/local electrical codes and the manufacturer's recommended installation instructions. Connection shall be with high performance, low impedance cables in conduit and shall not be any longer than necessary, avoiding unnecessary bends. Minimum wire size and overcurrent protection device for disconnect shall be provided as recommended by the manufacturer.

B. Units specified for lighting and appliance panel boards as panelboard extensions (EGPE) shall be mounted directly above or below the first section of the panel board it is protecting. Any other mounting location will not be acceptable and shall be corrected, without exception, at no additional cost to the Owner.

C. Units specified for panelboards, switchboards, or motor control centers shall be mounted directly above or adjacent to the panelboard, switchboard or motor control center using unistrut supports secured to structure as required. Conduit length between power distribution panelboard or switchboard shall be less than two inches. Mounting above equipment is not acceptable.

D. Overcurrent device and conductors for devices shall be the maximum recommended by the manufacturer. Manufacturer’s recommendations shall prevail over the information given in the plans and specifications.

E. Provide recessed mounted panelboard extension type enclosures for devices protecting recessed panelboards. Enclosure front shall match panelboard front material and finish. Provide brushed stainless-steel front at kitchens and food processing areas.

3.2 UNIT SELECTION BASED ON EXPOSURE LEVEL

A. (SPDSEL) Provide very-high exposure SPDs with Selenium and TPMOV technology

for the following new electrical or where indicated:

1. Service entrances with very high transient exposure and/or subject to utility temporary over voltages and/or projects deemed Mission Critical.

B. (SPDH) Provide high exposure SPDs for the following new electrical equipment or where indicated:
   1. Service entrance rated above 800 Amps.
   2. Switchboards located outside.

C. (SPDM): Provide medium exposure SPDs at the following new electrical equipment or where indicated:
   1. Service entrance rated 401 - 800 Amps.
   2. Panelboards above 600 Amps.
   3. Motor control centers.
   4. Non-service entrance switchboards.

D. (SPDL): Provide low exposure SPDs at the following new electrical equipment or where indicated:
   1. Service entrance rated 400 Amps and below.
   2. Panelboards 600 Amps and below.

3.3 TESTING

A. Factory Trained Representative shall provide start-up to include initial verification of proper installation, shortest cable connection, and initiate factory warranty. The technician will be required to do the following as a minimum:
   1. Verify the installation follows applicable national / local electrical codes related to SPDs and the manufacturer's Installation, Operation and Maintenance Instructions and recommendations.
   2. Verify overcurrent device rating.
   2. Verify all wiring connections and installation conforms to manufacturer’s recommendations.
   3. Record information for each product installed and include in O&M Manual

B. A copy of the Factory diagnostic test report and written approval of the installation shall be included with the Electrical Operating and Maintenance Manual. The Contractor shall make all adjustments, changes, corrections, etc. as required by the Factory Trained Representative so that the installation follows the manufacturer’s installation and operation instructions without additional charge to the Owner.

END OF SECTION

SECTION 26 51 13

LIGHTING FIXTURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work Included: Lighting fixture work is as shown, scheduled and specified.

B. Applications: The applications of lighting fixtures required for the project include the following:
1. General lighting
2. Emergency lighting
3. Outdoor area lighting

1.2 QUALITY ASSURANCE

A. Provide interior building LED fixtures that comply with the Design Lights Consortium (DLC) standards and are DLC or DLC Premium listed as a Qualifying Product at time of proposal submittal date.

B. UL Standards: Lighting fixtures shall conform to applicable UL standards, and be UL or ETL labeled.

C. Light fixtures shall conform to the requirements of NFPA 101, and 70 (NEC).

1.3 SUBMITTALS

A. Submit product data for light fixtures, and emergency lighting equipment, including generator transfer devices.

B. Specification Compliance Review: Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer / Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy with the product data.

C. Submittal data shall include luminaire efficiency parameters.

D. Submittal data for exterior luminaries shall include IESNA BUG ratings, backlight, uplight, and glare ratings of each unique luminaire for the orientation and tile specified. Indicate total absolute lumens per luminaire and absolute lumens emitted above horizontal based by each luminaire for the orientation and tile specified.

1.4 WARRANTY

A. Provide 5-year warranty on all light fixtures, including internal or remote LED drivers, all other electrical internal electrical or electronic components except for emergency battery packs or emergency load control device relays. Refer to other specific component warranty requirements below.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Provide products produced by manufacturers shown or scheduled for each type of lighting fixture. Refer to drawings for additional approved manufacturers.

1. Light fixtures:
   US LED
   Extra Light
   Acuity
   Signify
   Cooper Lighting Solutions
   Pinnacle
   HE Williams
   Current
   LSI
2. LED Drivers:
   Philips
   Osram Optotronic
   Eldo LED
3. Emergency Battery Packs with self-testing drivers/inverters: Shall be the same manufacturer as the low voltage lighting controls provided on this project. Where there are no low voltage lighting controls specified or provided, the manufacturer shall be Bodine.
   Bodine
   Chloride
   Lithonia
   Dual Lite
   IOTA
4. Emergency Generator/Inverter Load Control Bypass Relay (ELC); UL924 listed and 0-10Vdc compatible: Shall be the same manufacturer as the low voltage lighting controls provided on this project. Where there are no low voltage lighting controls specified or provided, the manufacturer shall be Bodine.
5. Emergency Generator / Inverter Branch Circuit Transfer Switch, UL 1008 listed and 0-10Vdc compatible:
   Bodine GTD20A

2.2 MATERIALS AND COMPONENTS

A. General: Provide lighting fixtures of the size, type, and rating indicated, with all accessories for a complete aesthetic installation.

B. Fixture Types:

1. General:
   a. LED Lay-in edge lit or back flat panel / troffer fixtures: Opaque, edge or back lighted, 4000 Kelvin color temperature. 0-10 Vdc dimmable, L70: 60,000 minimum hours.
   b. Safety chains and wire guards at fixtures in mechanical and electrical rooms, and high abuse areas. Provide safety chains only for gymnasium fixtures which shall be inherently vandal proof, no wire guards.
   c. Fixtures located outdoors, in interior unconditioned spaces, and in wet locations shall be of aluminum construction.
   d. Fixtures with door frames shall be of aluminum construction, white finish where located in kitchens, food prep areas, toilets, restrooms, locker rooms, dressing rooms, showers, and unconditioned spaces.
   e. DLC, DLC Premium or Energy Star qualified unless specified otherwise.
   f. Outdoor fixtures shall include a discrete / replaceable surge suppression

device in addition to the surge suppression incorporated in the LED driver.

g. Operating temperature rating shall be between -40 degrees F and 120 degrees F.

i. Color Rendering Index (CRI): ≥ 80 Indoor; ≥ 65 Outdoor

j. The manufacturer shall have performed JEDEC (Joint Electron Devices Engineering Council) reliability tests on the LEDs as follows: High Temperature Operating Life (HTOL), Room Temperature Operating Life (RTOL), Low Temperature Operating Life (LTOL), Powered Temperature Cycle (PTMCL), Non-Operating Thermal Shock (TMSK), Mechanical Shock Variable Vibration Frequency, and Solder Heat Resistance (SHR).

2. Downlight Fixtures: Provide recessed downlight fixtures with trim rings compatible with the ceiling material where fixture is to be installed.

3. LED Exit Signs: Provide red lettering. Exit lighting fixtures shall meet the requirements of Federal, State, and Local Codes. Edge-lit exit signs shall have a silver background so that “EXIT” cannot be read backwards from the opposite side.

a. Gymnasiums, locker rooms, athletic/PE wing and associated corridors, black box theaters, auditorium stages, cafetoriums and kitchens: Vandal resistant, wet location cast aluminum with polycarbonate protective cover exit signs, Lithonia Extreme Series.

4. Emergency Lighting Units: Lead Calcium batteries with self-diagnostics. Provide full light output at 90 minutes of battery operation. LED lamps.

5. Gymnasium light fixtures, glass or acrylic refractors or lenses, round profile, single point swivel pendant or hook mounting, designed to be vandal proof without the need for wire guards, no wire guards.

C. LED drivers:

1. NEMA 410 compliant for in-rush current.
2. Starting Temperature: -40˚ F [-40˚ C].
3. Input Voltage: 120 to 480 (±10%) V.
4. Power Supplies: Class I or II output.
5. Surge Protection: The system must survive 250 repetitive strikes of “C Low” (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. “C Low” waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
6. Power Factor (PF): ≥ 0.90.
7. Total Harmonic Distortion (THD): ≤ 20%.
8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.
9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.

D. Voltage: Equipment for use on 120V systems shall be suitable and guaranteed for voltage range of 100V to 130V. Equipment on 277V systems shall be suitable and guaranteed for voltage range of 225V to 290V. Universal voltage equipment shall be suitable and guaranteed for a voltage range of 100V to 290V.

E. Light fixture housing for exterior use: Provide aluminum or stainless housing. Where stainless steel hardware is used, both male and female fasteners shall be stainless steel.

F. Emergency LED battery self-testing drivers and inverters; 5-year warranty. Basis of Design:

1. Bodine BSL-ST Series for OEM installation
2. Bodine BSL310-SI Series for field installation
3. Bodine ELI-S Series for line voltage sine wave inverter field installation

G. Emergency Battery Packs – Exit Signs: Nickel Cadmium battery with self- diagnostics;

Minimum 3-year non-prorated replacement warranty.

H. Emergency Generator / Inverter Load Control Device (ELC):
1. 16 Amp minimum ballast / driver load
2. Compatible with 0-10 Volt dimmer switches
3. UL 924
4. Minimum 3-year warranty
5. Integral or remove test switch.

I. Emergency Generator / Inverter branch circuit transfer switch:
1. UL 1008
2. 20 Amp ballast/driver load
3. 0-10Vdc dimming compatible

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install lighting fixtures of the types indicated, where shown, and at indicated heights in accordance with the fixture manufacturer's written instructions and industry practices to ensure that the fixtures meet the specifications. Fixtures shall fit the type of ceiling system scheduled.

B. Standards: Comply with NEMA standards, applicable requirements of NEC pertaining to installation of interior lighting fixtures, and with NECA Standard of Installation.

C. Attachment: Fasten fixtures to the indicated structural support members of the building. Provide four separate wire supports for recessed ceiling mounted lighting fixtures, one at each corner of fixture. Check to ensure that solid pendant fixtures are plumb. Provide T-bar locking clips on all four sides for lay-in fixtures.

D. Coordination: Field coordinate and locate lighting fixtures in open ceiling areas including mechanical and electrical rooms so that light is not obstructed by piping, ductwork, etc. Locate light fixtures in front of electrical and mechanical equipment to provide adequate illumination for testing and maintenance. Relocate installed light fixtures as directed by Owner / Architect at no additional cost.

E. Final adjustment of all aimable exterior light fixtures shall be in coordination with, and to the satisfaction of, the Owner’s designated representative. Pre-aim all fixtures prior to scheduled final aiming and adjustment with Architect / Owner. Verify that all rotatable optics are in their proper orientation prior to final aiming.

F. Provide vandal resistant exit signs without wire guards in all physical education and athletic sports areas, including egress corridors adjacent to these areas, black box theaters, auditorium stages, vocational shops, cafetoriums and kitchens.

G. Provide exit sign directional arrows as required. Provide a minimum of two and a maximum of 10% spare exit signs to be installed as directed by Architect.

H. Install in accordance with manufacturers instructions.

I. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminary at indicated height.

J. Locate recessed ceiling luminaires as indicated on the Architectural reflected ceiling plan.

K. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

L. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide auxiliary members spanning ceiling Ts to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling T using bolts, screws, rivets, or suitable clips.

M. Install recessed luminaires to permit removal from below.

N. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.

O. Install wall-mounted luminaires at height as directed by Architect.

P. Install accessories furnished with each luminary.

Q. Connect luminaires to branch circuit outlets using flexible conduit as specified.

R. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaires.

S. Bond products and metal accessories to branch circuit equipment grounding conductor.

T. Provide emergency transfer devices for light fixtures powered by generator or inverter emergency lighting circuits which are used for normal lighting and to be switched with the switched normal lighting circuit in the same room, corridor or area.

U. Provide un-switched, constant-hot circuit to all battery powered emergency lighting equipment and emergency load control devices (ELC). Where normal light fixture circuit is switched or contactor controlled, non-switched battery charging or ELC circuit shall originate from same branch circuit breaker as switched lighting circuit.

V. Provide emergency powered light fixture in front of all electrical switchgear, including but not limited to panelboards, switchboards, motor control centers, low voltage control panels, transfer switches, motor controllers and disconnect switches.

W. Provide emergency battery operated light fixtures at all transfer switch locations and at all central battery emergency lighting inverters.

X. Provide automatic controls for exterior light fixtures. Exterior building mounted light fixtures shall be circuited through lighting contactors. Lighting contactors shall be controlled by the Building Management System. Provide separate lighting contactors for:
   1. Parking Lot Lighting
   2. Building Mounted Lighting
   3. Exterior Signage

Y. Lighting contactors shall not be installed above ceiling and shall be readily accessible, located in same room as panelboard serving load.

Z. Wall mounted light fixtures shall be attached to the studs in the walls. Attachment to gypsum board only is not acceptable. Where wall mounted fixtures attach to junction box only, firmly secure junction box to adjoining studs in wall.

AA. Lighting Fixture Supports:

1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction to the structural slab or to structural members within a partition, or above a suspended ceiling.
2. Shall maintain the fixture positions after cleaning and relamping.
3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.

BB. Hardware for surface mounting fixtures to suspended ceilings:
1. In addition to being secured to any required outlet box, fixtures shall be bolted to a grid ceiling system at four points spaced near the corners of each fixture. The bolts shall be not less than 1/4 inch secured to channel members attached to and spanning the tops of the ceiling structural grid members. Non-turning studs may be attached to the ceiling structural grid members or spanning channels by special clips designed for the purpose, provided they lock into place and require simple tools for removal.
2. In addition to being secured to any required outlet box, fixtures shall be bolted to ceiling structural members at four points spaced near the corners of each fixture. Pre-positioned 1/4-inch studs or threaded plaster inserts secured to ceiling structural members shall be used to bolt the fixtures to the ceiling. In lieu of the above, 1/4-inch toggle bolts may be used on new or existing ceiling provided the plaster and lath can safely support the fixtures without sagging or cracking.

CC. Lighting Fixture Supports for aluminum canopies:
1. Light fixtures mounted under aluminum canopies shall be UL wet location from above listed without a protective ceiling or cover. Light fixture shall not have conduit penetrations or mounting hole penetrations field made in the top of the fixture. Conduit penetration shall be at the end of the fixture only.

3.2 TESTING

A. General: Upon installation of lighting fixtures, and after building circuits are energized, apply electrical energy to demonstrate proper operations of lighting fixtures, emergency lighting, and controls. When possible, correct malfunctioning units at the site, then retest to demonstrate proper operation; otherwise, remove and replace with new units, and proceed with retesting.

B. Pre-Inspection Tasks: Immediately before final inspection, clean fixtures inside and out, including plastics and glassware, adjust trim to fit adjacent surfaces, replace broken or damaged parts, and lamp and test fixtures for electrical and mechanical operations. Any fixtures, or parts of fixtures that show signs of rust or corrosion at the time of completion, shall be removed, and replaced with protected metal parts.

C. Final aiming and adjustment: Aim and adjust lighting fixtures for their intended purpose as specified or as required. Adjustments may include but not be limited to directional aiming, adjusting selectable lumen output, selectable correlative color temperature (CCT), selectable beam pattern, replacing/installing fixture manufacture’s optional optical lens used for adjusting beam patterns or for softening beam edges, replacing/installing manufacture’s optional theatrical/specialty color lens colors. Re-aim and re-adjust as required to the satisfaction of the Architect / Owner, including nighttime adjustment of exterior lighting in the presence of the Architect / Owner.

END OF SECTION

SECTION 26 56 00

SITE LIGHTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The extent of site lighting required is indicated on the drawings and schedules and by the requirements of this Section and Section 26 05 00 General Electrical Provisions.

B. Poles and Standards specified in this Section are for outdoor use for the support of luminaires and include the following: Aluminum and/or steel

1.2 QUALITY ASSURANCE

A. Codes and Standards: Provide luminaires, poles standards and appurtenances conforming to the following:
   1. Conform to applicable sections of American Association of State Highway and Transportation Officials (AASHTO): LTS-1 Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.
   2. American National Standards Institute (ANSI):
      a. C2 National Electrical Safety Code.
   3. Conform to applicable sections of American Society for Testing and Materials (ASTM)B 429, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
   4. National Electrical Manufacturers Association (NEMA):
      a. FA 1 Outdoor Floodlighting Equipment.
      b. OD 3 Physical and Electrical Interchangeability of Photo Control Devices and Mating Receptacles.
   5. Conform to applicable sections of National Fire Protection Association (NFPA) 70, National Electrical Code.
   6. Underwriters Laboratories, Inc. (UL):
   7. Design Lights Consortium (DLC)

1.3 SUBMITTALS

A. Refer to Section 26 05 00 General Electrical Provisions. Submittal must include photometric reports, otherwise they will be rejected as incomplete.

B. Contractor shall not rough-in, build concrete foundations, etc. for site lighting until all site lighting submittals have been approved. Contractor shall submit site lighting photometrics with product data. The review of site lighting submittals may include the relocation, addition or deletion of lighting fixtures, poles and standards due to the photometric performance of substituted manufacturers. Any changes required due to the contractor’s substitution shall be at no cost to the Owner.

C. Submittal sheets shall be sequentially numbered with the format: Sheet number of number total. Example 1 of 3

D. Submit manufacturer’s product data including the following:
   1. Line-by-line compliance of the specification indicating compliance or description of deviation.
   2. Submit a computer generated point-by-point calculations for all outside lighting.
   3. Dimensioned and detailed drawings in booklet form with separate sheet or sheets for each fixture, assembled in luminaire “type” alphabetical order and showing: materials of construction; arrangement of components and wiring; gasketing for weather tightness; means of mounting luminaire and adjusting aspect; finishes; photometric data with lamp or lamps specified; electrical data including volts, amperes and watts; and for roadway type luminaires, distribution data according to Illuminating Engineering Society (IES) roadway classification type.
   4. LED Driver and light engine, initial and mean lumen output, and color rendering index.

LED drivers and related electrical characteristics and operating conditions.

5. Poles and standards dimensions, details of hand holes and wire entries, mast or bracket arms and connection to poles, wind load and deflection, and finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers acceptable contingent upon Product's compliance with the specifications: refer to Lighting Fixture Schedules on the drawings for acceptable manufacturers of light fixtures. Acceptable Pole Manufacturers: Valmont, KW, WJM.

B. Where lighting regulations exist by the Authority Having Jurisdiction, the Contractor shall be responsible for submission of all documentation and approval from the Authority Having Jurisdiction of the exterior lighting were alternate manufacturers are proposed other than specified. Where approval from an Authority Having Jurisdiction is required, Contractor shall submit, with those product data, confirmation of approval from the Authority Having Jurisdiction.

2.2 LUMINAIRES

A. Refer to Section 26 51 13 Lighting Fixtures and Lamps, for ballast, drivers, and lamp requirements.

B. Provide luminaires of the sizes, type and ratings indicated, complete with housings, lenses, refractors, lamps, lamp holders, reflectors, ballasts, starters, igniters, mounting brackets or hardware with adjusting means and wiring.

C. Provide luminaires with rigidly formed, weather and light tight enclosures that will not warp, sag, or deform in use. Provide housings free from burrs, sharp edges or corners.

D. Provide captive hardware hinged doors, operating freely, to allow lamp installation and removal without the use of tools. Equip door mechanism to preclude accidental falling of the door when opening or closing or when secured in the closed position. Provide for door removal for cleaning or replacing lens.

E. Provide stainless steel hinges, latches, fasteners, and hardware to prevent corrosion of hardware or the staining of adjacent surfaces.

F. Use interior formed and supported light reflecting surfaces having reflectances of not less than 85 percent for white surfaces, 85 percent for specular surfaces, and 75 percent for specular diffuse surfaces.

G. Use borosilicate tempered glass, lenses and refractors. Use heat and aging resistant resilient gaskets to seal and cushion lens and refractor mounting in luminaire doors.

H. Provide finishes of the color and type indicated and having the following properties:
1. Protection of metal from corrosion - 5 year warranty against perforation or erosion of the finish from weathering.
2. Color retention – 5-year warranty against fading, staining, or chalking from weathering, including solar radiation.
3. Provide finish of uniform thickness and color, free from streaks, stains or orange peel texture.

I. LED sources shall meet the following requirements:
1. Operating temperature rating shall be between -40 degrees F and 120 degrees F.
2. Color Rendering Index (CRI): ≥ 65.
3. The manufacturer shall have performed JEDEC (Joint Electron Devices Engineering Council) reliability tests on the LEDs as follows: High Temperature Operating Life (HTOL), Room Temperature Operating Life (RTOL), Low Temperature Operating Life (LTOL), Powered Temperature Cycle (PTMCL), Non-Operating Thermal Shock (TMSK), Mechanical Shock Variable Vibration Frequency, and Solder Heat Resistance (SHR).

J. LED drivers shall meet the following requirements:
1. Drivers shall have a minimum efficiency of 85%.
2. Starting Temperature: -40˚ F.
3. Input Voltage: 120 to 480 (±10%) V.
4. Power Supplies: Class I or II output.
5. Surge Protection: The system must survive 250 repetitive strikes of “C Low” (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. “C Low” waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
6. Power Factor (PF): ≥ 0.90.
7. Total Harmonic Distortion (THD): ≤ 20%.
8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.
9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.

2.3 POLES AND STANDARDS

A. Provide poles of the types and heights indicated. Provide internal raceway for underground power supply, with luminaire support pole base indicated. Provide poles that will carry the indicated supports, luminaires and appurtenances, at the required heights above grade, without excessive defection or whipping of the luminaire when subjected to 120 mph basic wind speed with 1.3 gust factor. Pole structural integrity shall rely solely on the anchor bolts, nuts and washers. Pole shall not be in direct contact with concrete base or mortar.

B. Provide metal lighting poles with steel or aluminum shaft; equipped for post top or mast arm luminaire mounting. Provide wiring access hand hole with welded ½” NC ground lug, readily accessible from hand hole opening. Provide features as follows:
1. Provide a one-piece pole shaft fabricated from a weldable grade carbon structural steel tubing with a uniform thickness as required. Material shall conform to ASTM A-500, Grade C.
2. Provide anchor base of the same material and finish as the pole, welded to the pole. Provide adequately sized (at least 15 square inches) hand hole with screwed cover. Provide galvanized steel hold-down or anchor bolts and leveling nuts. Provide full base cover.
3. Factory prime coat with polyester powder-coat paint. Steel poles shall be hot dipped galvanized, with prime coat, with 8 mil minimum polyester powder-coat paint. Color to match light fixture.

C. Anchor bolts:
1. Provide zinc coated anchor bolts and nuts. Length shall be per pole manufacturer’s shop drawings, complete with 3 inch right angle bend on one end and 6 inches of thread on the other end. Provide zinc coated flat washers, lock washers, and hexagonal nuts for each pole.
2. Provide template for positioning of anchor bolts.

D. Accessories:
1. Full base covers, finish to match pole
2. Hand hole with cover plate and vandal resistant hardware.

2.4 LUMINAIRE MOUNTING

A. Provide corrosion resistant metal luminaire mounting compatible with the poles and fixtures that will not cause galvanic action at contact points. Provide mounting that will correctly position the luminaire to provide the required light distribution. Provide drill mounting to pole shaft unless specified otherwise.

B. Provide brackets, cantilevered and without under brace, of the sizes, styles, and finishes indicated with straight tubular end section to accommodate the luminaire.

C. Provide steel tenon only for single fixture yoke or spider post top mounting securely fastened to the top of the pole shaft, fabricated to accept and rigidly support the luminaire to be mounted thereon. Set screws shall have pole shaft drilled to prevent rotational movement.

PART 3 - EXECUTION

3.1 LIGHTING POLE INSTALLATION

A. Contractor shall not rough-in conduit, drill or pour concrete foundations for site lighting until review of the site lighting submittals is complete. This is to ensure coordination with the current site plan paving and utilities and photometric performance of the submitted product.

B. Install lighting poles as follows:
1. Install lighting poles and standards as indicated, in accordance with manufacturer's written instructions, and in compliance with ANSI C2.
2. Provide excavation and poured concrete bases using 3,000 pound 28-day concrete, and provide anchor hook-bolts, nuts and washers in conformance with the details and manufacturer's requirements. Refer to Division 3 for concrete work. Project anchor bolts 2-inches minimum above base. Use double nuts for adjustment.
3. To protect finish, use fabric web slings (not chain or cable) to raise and set finished poles and standards.
4. Install pole clear of contact of concrete base or mortar.

C. Grounding: Provide equipment bonding and grounding connections, sufficiently tight to assure permanent and effective grounds. Bond all metal, non-current carrying parts to ground. Provide 25-feet #4 solid ground electrode from pole base hand holes encased in concrete pier, to bottom of concrete pier with excess ground electrode coiled at bottom of concrete pier. Secure the ground electrode to the reinforcement steel to prevent movement during concrete pour. Bond all metal parts of the pole shaft ground lug. Provide #6 electrode grounding conductor from pole base ground lug to the ground conductor, using thermal fusion (exothermic) methods.

D. Wiring:
1. Provide Type SO cord from base of pole lights to top of poles. Do not use single conductors.
2. Install inline fuse holders, fuses, at base of pole lights on each lighting circuit. Provide Bussman Insulating boot Catalog # 2A0660 installed over conductor terminations. Fuse size shall be as follows:

WATTAGE	# OF Fixtures	208V	240V	277V	480V
0-400	1	5	5	5	5
0-400	2	8	8	5	5
0-400	3	10	10	8	5
0-400	4	15	10	10	8
401-1000	1	10	8	8	5
401-1000	2	15	15	15	8

3. Provide Styrofoam wedge at midpoint of pole to stabilize conductor.
4. Provide strain/stress relief on SO cord at top of pole.

3.2 LUMINAIRE INSTALLATION

A. Install exterior luminaires at locations and heights as indicated, in accordance with the manufacturer's written instructions, applicable requirements of NFPA 70, ANSI C2 and with recognized industry practices to ensure that lighting installation fulfills requirements.

B. Fasten luminaires securely to indicated structural supports and check to ensure that the required degree of freedom is provided to allow alignment or aiming of the fixtures for indicated light distribution.

C. Clean exterior luminaires of dirt and debris upon completion of installation. Do not damage finishes or lens or refractor surfaces.

D. Provide equipment grounding connections using branch circuit equipment and connected

sufficiently tight to assure a permanent and effective ground.

3.3 TESTS AND DEMONSTRATIONS

A. Upon installation of lighting fixtures, and after building circuits are energized, apply electrical energy to demonstrate proper operations of lighting fixtures, emergency lighting, and controls. Correct malfunctioning units, then retest to demonstrate proper operation; otherwise, remove and replace with new units, and proceed with retesting. Verify correct reflector types and orientation prior to final aiming.

B. Pre-Inspection Tasks: Immediately before final inspection, clean fixtures inside and out, including reflectors, plastics and glassware, adjust trim to fit adjacent surfaces, replace broken or damaged parts, and lamp and test fixtures for electrical and mechanical operations. Any fixtures, or parts of fixtures that show signs of rust or corrosion at the time of completion, shall be removed, and replaced with protected metal parts. Pre-aim lighting fixtures as practical prior to final aiming and adjustment.

C. Final aiming and adjustment: Aim and adjust lighting fixtures for their intended purpose as specified or as required. Adjustments may include but not be limited to directional aiming, adjusting selectable lumen output, selectable correlative color temperature (CCT), selectable beam pattern, replacing/installing fixture manufacture’s optional optical lens used for adjusting beam patterns or for softening beam edges, replacing/installing manufacture’s optional theatrical/specialty color lens colors. Re-aim and re-adjust as required to the satisfaction of the Architect / Owner, including nighttime adjustment of exterior lighting in the presence of the Architect / Owner.

D. The installing contractor shall provide an “As-Built” photometric report of the site lighting to 25’ beyond the property line at 3’ above grade and 15’ intervals after a continuous 200 hour burn-in of the fixtures. Photometrics shall be submitted with final closeout documents and bear the seal and signature of a registered professional engineer licensed in the state in which the project has been constructed and in the employ of the installing contractor or the lighting fixture manufacturer or lighting fixture manufacturer’s representative.

3.4 LAMP REPLACEMENT AND PROVISION OF SPARE LAMPS

A. At time of substantial completion, replace lamps in luminaires that are observed to be not functioning properly after Contractor’s use and testing. Provide spare replacement non-LED lamps amounting to 10 percent (but not less than ten lamps in each case) of each type and size lamp used in each type fixture.

END OF SECTION

SECTION 26 56 67

SPORTS FIELD LIGHTING SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the lighting system performance and design standards for athletic fields using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications. Basis of design manufacture: Musco.

C. The sports lighting will be for the following venues:
1. JV Football Field
2. Baseball Field
3. Softball Field
4. Tennis A
5. Tennis B
6. Throwing Events
7. Jumping Area
8. Track
9. Soccer

D. The primary goals of this sports lighting project are:
1. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore, light levels shall be guaranteed to not drop below specified target values for a period of 25 years from date of delivery of equipment to the site.
2. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
3. Life-cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be the responsibility of the manufacturer as indicated and included at no additional cost to the Owner for the duration of the warranty.
4. Control and Monitoring: Provide a remote on/off control system for the lighting system. Fields shall be proactively monitored to detect luminaire outages over the 25-year life cycle. All communication and monitoring costs for 25-year period shall be included at no additional cost to the Owner.

E. All lighting designs shall comply with local lighting ordinances.

1.2 SPECIFICATION COMPLIANCE REVIEW

A. Provide a complete written, item-by-item specification review indicating compliance or deviation in full description.

B. Mark up a complete copy of the specification section for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer / Owner (Does Not Comply, Explanation:) Do not submit an outline form of compliance, submit a complete copy of the specification with the product data.

1.3 WARRANTY AND GUARANTEE

A. 25-Year Warranty: Manufacturer shall provide a signed warranty covering the entire system for 25 years from the date of delivery to the site. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the

warranty for the full term. Warranty does not cover acts of God, weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or products made by other manufacturers.

B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 25 years from the date of equipment shipment. Individual outages shall be repaired when the usage of any field is materially impacted. In event of an outage, Owner shall verify for the manufacturer that power is available to each lighting circuit controller, fuses , and lighting contactors.

PART 2 – PRODUCTS

2.1 ILLUMINATION PERFORMANCE REQUIREMENTS

A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors including but not limited to dirt depreciation and optical material deterioration shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period. Due to various dimensions of some athletic fields the actual quantity of grid points may vary, however the grid spacings shall be taken over the entire playing surface and the exact quantity adjusted accordingly.

Area of Lighting: Average annual usage	**Average Target Illumination Levels**	**Maximum to Minimum Uniformity Ratio**	**Minimum Grid Points**	**Grid Spacing**
J V Football, Soccer: 250 hours	50 foot-candles	1.5:1.0	72-football, soccer as required	30’ x 30’
Baseball: 150 hours	50 foot-candles infield 30 foot-candles outfield	1.5:1.0 infield 2.0:1.0 outfield	25 infield as required for outfield	30’ x 30’
Softball: 150 hours	50 foot-candles infield 30 foot-candles outfield	1.5:1.0 infield 2.0:1.0 outfield	25 infield as required for outfield	20’ x 20’
Tennis A: 150 hours	50 foot-candles	1.5:1.0	60/court	20’ x 20’
Tennis B: 150 hours	75 foot-candles	2.0:1.0	60/court	20’ x 20’
Throwing Events: 150 hours	20 foot-candles	NA	as required	10’ x 10’
Jumping Area: 150 hours	20 foot-candles	10.0:1.0	as required	10’ x 10’
Track: 150 hours	20 foot-candles	7.0:1.0	as required	30’ x 30’
Soccer Pitch: 150 hours	50 foot-candles	1.5:1.0	as required	30’ x 30’

B. Color: The lighting system shall have a-color temperature of 4000K-5700K and a minimum CRI of

75.

C. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Provide mounting heights as required based on pole locations and setback from the field of play. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

D. Aiming of any luminaire shall not be greater than 60 degrees from nadir.

E. Center of luminaire cluster height at top of light poles: Typical average mounting height of a light cluster H = [(1/3 W) + SB} x tan 30. Width (W)]= width of playing surface from foul line or inbound/outbound line to the opposite foul line or inbound/outbound line in the direction of the principal aiming of respective light standard pole. Pole Set Back (SB) = the distance from the nearest foul line or inbound/outbound line to the proposed light standard pole location.

F. Unless indicated otherwise to exceed the values below, the center of an individual luminaire cluster's mounting height shall be as recommended by IES due to pole set back and as follows but in no case, shall any aiming angle of any luminaire aimed to the sports field exceed 60 degrees from nadir:

Baseball: 80 feet
Softball: 60 feet,
Football / Soccer 80 feet
Tennis 60 Feet
Track and Field: 100 feet

2.2 ENVIRONMENTAL LIGHT CONTROL

A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, optical lensing, internal shields, louvers, or external shields.

B. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified independent testing laboratory with a minimum of five years' experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

2.3 SPORTS LIGHTING SYSTEM CONSTRUCTION

A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested prior to shipment.

B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

C. System Description: Lighting system shall consist of the following:
1. Galvanized steel poles and cross-arm assembly.
2. Non-approved pole technology:
   a. Square static cast concrete poles will not be accepted.
   b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long-term performance concerns.

3. Lighting systems shall use concrete foundations.
   a. For a foundation using a pre-stressed concrete base embedded in concrete backfill, the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.
   b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or reinforced pier design pole, erection may occur after 7 days, or after a concrete sample from the same batch achieves a specified strength approved by the structural engineer.
4. Manufacturer shall supply all LED drivers and supporting electrical equipment
   a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum NEMA 3RX enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure shall be located in the enclosure.
5. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2_2002.
6. Wire harness shall be complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
7. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.
8. Control cabinet shall provide remote on-off control and monitoring of the lighting system.
9. Manufacturer shall provide lightning protection and grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
   a. Integrated grounding via concrete encased electrode grounding system.
   b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780.The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

D. Safety: All system components shall be UL listed for the appropriate application.

2.4 ELECTRICAL

A. Electric Power Requirements for the Sports Lighting Equipment:
   1. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

B. Equipment requiring electrical distribution more than that indicated or required by the basis of design shall be provided by the contractor at no additional cost to the Owner.

2.5 STRUCTURAL PARAMETERS

A. Wind Loads: Wind loads shall be based on the latest published edition of International Building Code and all local code requirements. Wind loads shall be calculated using ASCE 7-10, an ultimate design wind speed of 140 mph and exposure category C.

B. Manufacturer Pole Structural Design: The stress analysis and safety factor of the poles shall conform to the latest published edition of AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-5).

C. Manufacturer Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. If a geotechnical report is not utilized, the foundation design shall be based on class 5 soils.

D. Manufacturer Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list

the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole.

2.6 CONTROL

A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.

B. Lighting contactor cabinet(s) constructed of minimum NEMA Type 3RX aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

C. Remote Lighting Control System: System shall allow Owner and users with a security code to schedule on/off system operation via a web site, phone, fax, or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.
1. The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands. Scheduling tool shall be capable of setting curfew limits.
2. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

D. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).

E. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation, and service. Mobile application shall be provided suitable for IOS, Android, and Blackberry devices.

F. Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.
1. Cumulative hours: shall be tracked to show the total hours used by the facility
2. Report hours saved by using early off and push buttons by users.

G. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 25 years.

PART 3 – EXECUTION

3.1 SOIL QUALITY CONTROL

A. It shall be the Contractor’s responsibility to notify the Architect/Engineer/Owner immediately if unforeseen soil conditions exist other than those on which the foundation design is based or indicated in the project’s Geotechnical Report, or if the soil cannot be readily excavated.
1. Provide engineered foundation embedment design by a registered engineer in the State where the project is located for soils other than specified soil conditions;
2. Provide additional materials required to achieve alternate foundation design.
3. Excavate and remove from the site materials other than normal soils, such as rock, caliche, etc.

3.2 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.

B. Field Light Level Accountability
1. Light levels shall be guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 Years.
2. The contractor/manufacturer shall be responsible for an additional inspection one year

from the date of substantial completion or commissioning of the lighting system and shall also utilize the Owner's light meter in the presence of the Owner at the Owner's request.

3. The contractor/manufacturer shall make all changes needed to bring the fields back to compliance for light levels and uniformities. Contractor/Manufacturer shall be held responsible for any damage to the fields during these repairs and make repairs to the satisfaction of the Owner at no additional cost.

C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including foot-candles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Contractor/Manufacturer shall make all adjustments required to meet specifications and satisfy the Owner at no additional cost to the Owner.

END OF SECTION

SUBMITTAL INFORMATION
Design Submittal Data Checklist and Certification
All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements

Included	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by, and other pertinent data b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), or home plate for baseball / softball fields. Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, as well as luminaire information including wattage, lumens and optics d. Height of meter above field surface e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance and uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor. f. Alternate manufacturers shall provide both initial and maintained light scans using a maximum 0.70 Light Loss Factor to calculate maintained values.
	C	Off Field Lighting Design	Lighting design drawings showing spill light levels in footcandles as specified in section 1.3 A.
	D	Photometric Report	Provide photometric report for a typical luminaire used showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	E	Life Cycle Cost calculation	Document life cycle cost calculations as defined in the specification. Identify energy costs for operating the luminaires, maintenance cost for the system including spot lamp replacement, and group relamping costs. All costs should be based on 25 Years.
	F	Luminaire Aiming Summary	Document showing each luminaire's aiming angle and the poles on which the luminaries are mounted. Each aiming point shall identify the type of luminaire.
	G	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Texas.
	H	Control and Monitoring	Manufacturer shall provide written definition and schematics for automated control system to include monitoring. They will also provide examples of system reporting and access for numbers for personal contact to operate the system.
	I	Electrical distribution plans	If bidding an alternate system, manufacturer must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Texas.
	J	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed per specification for 25 years. Constant light systems shall provide independent 3rd party test data stamped by a registered engineer.
	K	Warranty	Provide written warranty information including all terms and conditions.
	L	Project References	Manufacturer to provide a list of project references of similar products completed within the past three years.
	M	Product Information	Complete set of product brochures for all components, including a complete parts list and UL Listings.
	N	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications.
	O	Compliance	Manufacturer shall sign off that all requirements of the specifications have been met at that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in item N – Non-Compliance

North Shore Multi-Use Indoor Facility
Galena Park ISD
Houston, Texas

Manufacturer: **Signature:**

Contact Name: **Date:** _____/_____/_____

SECTION 26 56 74

DIRECT BURIAL PRESTRESSED CONCRETE SPORTS LIGHTING POLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The following specification covers design, fabrication and installation of prestressed centrifugally cast concrete sports lighting poles.

B. Poles shall be designed and constructed so that all wiring and grounding facilities are concealed within the pole. All hand holes, wire inlets/outlets, inserts for pole steps, thru-bolt holes and ground wire shall be cast into the pole during the manufacturing process.

C. The specified ultimate wind speed for structural calculations shall be 100 mph, with a 1.3 gust factor.

PART 2 - PRODUCTS

2.1 DESIGN

A. Poles shall be designed considering the application of both dead load and wind load. The moment at any point along the length of the pole is to be the sum of moments resulting from dead loads and forces from wind load. The wind forces shall be computed by multiplying the wind pressure by the effective projected area (EPA) of the individual components.

B. The P-Delta secondary moments due to the deflected unbalance of the structure shall be accounted for in the design and shown in any calculations submitted.

C. Poles shall be designed to meet AASHTO requirements for wind loading.

D. Poles shall be designed such that the deflection does not exceed 1.0% of the free height of the pole at its maximum EPA under a wind loading equivalent to the designated ultimate wind speed, including a 1.3 gust factor.

E. The natural frequency of the pole shall be limited to 0.8 cycles/sec. The manufacturer shall provide calculations indicating the above requirements.

2.2 APPROVED MANUFACTURERS

A. The manufacturer shall have a minimum of ten years of experience in the design and production of centrifugally spun concrete poles.

B. All manufacturing tolerances, details or reinforcement and finishes shall be in accordance with Guide Specification for Prestressed Concrete Poles, as published in the Journal of the Prestressed Concrete Institute.
1. Stresscrete
2. Newmark/Valmont
3. Ameron

C. Poles shall be prestressed concrete poles, manufactured by the centrifugal spinning process. Poles shall be round in cross section with a hollow center.

D. Prestressing strands shall run the entire length of the pole and shall be terminated through the tip section.

E. Prestressing forces shall be limited to 65% of the ultimate yield strength of the prestressing strand.

F. Forms shall be designed to provide a continuous taper of 0.18-inch per foot of length and provide a minimum concrete cover of ¾-inch over the prestressed steel.

G. Poles shall have a smooth, natural form finish, soft gray color.

H. Pole will be of single construction through 120', unless otherwise specified.

2.3 MATERIALS

A. Concrete - The concrete mix shall be designed to achieve a minimum 28-day compressive strength of 8,000 psi. Cement shall conform to the latest requirements of Type I or Type III Portland Cement in accordance with ASTM-C150. Maximum size aggregate may be 3/4" or 75% of the clear spacing between main reinforcing steel and surface of pole. Any water reducers, retarders, or accelerating admixtures shall conform to ASTM-C494. Water shall be free from foreign materials in amounts harmful to concrete and embedded steel. In production facilities subject to frequent freezing, an air entrapment mixture shall be used to produce 5-8% air content prior to spinning.

B. Prestressing Steel - Prestressing steel reinforcement shall conform to uncoated 7-wire stress relieved strand (including low relaxation) per ASTM-A416.

C. Spiral Reinforcement - steel spiral reinforcement shall conform to the requirements of ASTM-A82 and shall not be less than 0.15-inches diameter. The pitch of the spiral steel shall not be greater than 3.2 inches or the radius of the pole, whichever is less.

D. Reinforcing steel – Deformed reinforcement steel shall conform to the requirements of ASTM A615 for Grade 60 Rebar.

E. Hardware - All structural steel shall conform to ASTM-A36 and be hot dipped galvanized in accordance with ASTM-A123. Zinc alloy AC41A for inserts, hand hole frames and covers, and shall conform to ASTM-B240. All bolts, nuts, washers and other fasteners must be either stainless steel or hot dipped galvanized per ASTM-A153.

2.4 POLE ACCESSORIES

A. Nameplate - a brass nameplate shall be cast into the wall of the pole approximately 5' above the ground line, identifying the name of the manufacturer, job identification or order number, overall length, and actual weight.

B. Each pole shall have a galvanized steel cap. The pole base shall be plugged to provide extra bearing surface.

C. Step Bolts - Shall be 5/8" diameter, alternately spaced on 15" intervals, 90-120 degrees apart, beginning 10' above ground and continuing to within 18" of platform / cross arm. The top and bottom step location are to be doubled (one step on each side of the pole).

D. Safety Climbing Cable - Safety climbing cable shall be 5/16-inch diameter, galvanized steel, and shipped loose for field installation. Cable shall extend to top rail of platform, allowing climber to enter platform prior to disengaging safety belt.

E. Safety Belt - A nylon safety belt and one stainless steel QUICK-STOP latch shall be provided for the project.

F. Grounding - a #6 stranded copper ground wire shall be cast into the wall of the pole. The ground wire shall be terminated in a copper tank ground at the top platform / cross arm level and approximately 12" below grade. The copper tank ground shall provide a tapped insert for the grounding of hardware.

G. Lightning Rod - A 60-inch lightning rod shall be attached to the galvanized cap located at the tip of the pole.

H. All cable entry holes shall be in accordance with the location and sizes as required and shall be free from sharp edges for passages of electrical wiring. All handhole frames shall be composed of a non-metallic, non-conductive injection molded material or a rugged high density cast zinc.
1. A 3” x 12” or 4” x 10” conduit entrance opening centered 18” below grade (depending on size of poles).
2. A 3.5” x 10.5” handhole frame with flush cover centered 3’-6” above grade (or as specified).
3. A 2.5” x 8.5” handhole frame with flush cover located 180 degrees from disconnect switches.
4. Top wiring shall be through a 2” or 1-1/2” threaded coupling whichever is suitable for the diameter of the pole with access by way of 2-1/2” x 8” handhole frame with flush cover located at platform / cross arm level for use during installation and maintenance of electrical wiring. A “J” hook wire hanger shall be provided at top coupling location for use with kellems grip, or as needed by specifier.
5. All poles shall be provided with a fish wire to facilitate cable installation.

I. Provisions shall be made for attaching and wiring any disconnect switches or other electrical components specified and including those not specified but required to complete the project.

J. Enclosed wiring terminal strips for power distribution shall be in a NEMA 4X stainless steel enclosure.

2.5 INTERNALLY WIRED LUMINARIE CAGE

A. Structural Components: The cage shall be made of round tubular members to reduce wind drag and allow for internal wiring of the fixtures. The cage shall consist of a horizontal member 5.5 to 6" in diameter, and vertical luminarie supports made from 2" pipe. The vertical luminarie supports shall incorporate angles, predrilled per the luminarie manufacturer’s specifications, for mounting the fixtures. The floor shall be 3 lb. per sq. ft. metal grating with a hinged door allowing for access to the cage. The door shall be capable of closing prior to uncoupling of the safety climbing device. The cage’s perimeter shall be strung twice with 3/16" galvanized aircraft cables or structural angle iron at 28" and 44" above the floor for safety of the maintenance person.
1. Mounting supports for electrical distribution panelboards shall be welded to the cage structure above.

B. Wiring:
1. The tubular cage and cross arms shall be internally hard wired with 16AWG copper stranded wire encased by a synthetic rubber molding that is rated at 90°C and 600 volts.
2. The wire shall be terminated at each fixture location on the cage and cross arms with a ½" NPT receptacle threaded into the luminarie support angle. All internal cage wiring shall be pulled to one or each end of the main horizontal tube for termination in NEMA 4X junction box, using terminal strips or other approved method. Each set of wires shall be marked and identified by fixture location.
3. Mating parts shall be mechanically keyed to prevent mis-mating. Pins extending

from male devices shall be recessed for protection.

4. A molded rubber collar shall circle the base of each male pin to form a cork-like seal with each female socket. Pins and sockets shall be machined from solid bar stock to provide maximum moisture resistance. The grounding pins shall be extended for maximum safety. Receptacle ends shall be epoxied for durability and moisture resistance.
5. Fixture connection to cage shall be 3' of S00W-A cable for proper attachment. This cable shall be rated at 600 volts and 105°C.
6. All electrical components shall be UL recognized (UL #53429) and shall be rated for 480 volts.
7. Cage wiring terminations shall be of sufficient length to terminate to NEMA 4x junction box mounted on cage.

2.6 INTERNALLY WIRED CROSSARMS

A. Structural components: The cross arms shall be made of round or square tubular members and allow for internal wiring of fixtures.

2.7 WELDING

A. Welding shall be in accordance with AWS (American Welding Society) Structural Welding Code D1.1 Sections 1 through 8 and shall be performed by welders certified in accordance with the AWS Code. Pole to base plate circumferential welds shall either have 1) 100% penetration, be free of cracking and undercutting, and be ultrasonically tested, or 2) a telescopic welded joint and magnetic particle tested. Longitudinal seam welds shall be free of cracks and undercutting, performed with automatic processes, and visually inspected with questionable areas inspected by magnetic particle to AWS D1.1. The longitudinal weld on the female section of lap splices shall be either 100% penetration with quality assured by ultrasonic inspection per AWS D1.1 or shall be reinforced externally.

2.8 GALVANIZING

A. Cages and cross arms shall be galvanized in accordance with the requirements of ASTM A123. Each component shall be completely coated in a single dip. No double dipping shall be allowed. All miscellaneous hardware shall be galvanized per ASTM A153.

2.9 MATERIAL CERTIFICATIONS

A. All materials and products shall be produced in the United States of America. They shall be of the ASTM type as called forth in this specification. Mill certifications shall be supplied for proof of compliance to this specification.

2.10 POLE HEIGHT

A. Pole height shall be as specified and is defined so that the lowest luminarie for the sports field lighting shall be at the specified pole height above the playing field. Minimum luminaire mounting height shall be 70 feet.

B. Playing field elevation shall be defined as follows: Baseball and softball, average infield elevation; football and soccer, center of field; tennis, elevation of court.

C. Luminaire mounting height resulting from the use of maintenance cages may be used to determine actual pole shaft length.

2.11 POLE TOP ELECTRICAL DISTRIBUTION

A. NEMA 4X stainless steel hinged enclosure with back plane as required, terminal blocks for power distribution and grounding.
   1. Schneider Electric - Square D #LBA363206 power distribution block with clear plastic covers for each row of luminaries.
   2. Schneider Electric - Square D #LBA363206 power distribution block for each cage for equipment grounding.
   3. Equal by GE.

2.12 POLE BASE EXTERNAL DISCONNECT AND FUSING

A. NEMA 4X stainless steel, lockable, hinged dead front enclosure with back plane and DIN rail mounting as required. Front plane for rotary disconnect switches, rotary disconnects and fuse blocks as required.
   1. Schneider Electric - Square D # FB3611CC miniature fuse holder for each row of luminaries.
   2. Bussmann LP-CC-30, 30 Amp fuses, 600 Volt, 200,000 Amp interrupting rating.
   3. Schneider Electric - Square D #D10S2 lockable rotary disconnects with front plane mounted handle mounted.
   4. Equal by GE.

2.13 VERTICAL POLE SHAFT CABLE AND CABLE SUPPORTS

A. Coleman Cable & Wire Co. Seoprene 105 Size SEOW-A 600V UL 105C (-40C) water resistant 10/4.

B. Hubbell Wiring Device-Kellems standard duty support grip, universal eye, single weave, tin-coated bonze.

PART 3 - EXECUTION

3.1 TRANSPORTATION AND INSTALLATION

A. Transportation, site handling and erection shall be performed by qualified personnel with equipment and methods that are in accordance with standard industry practices.

B. Prior to unloading the pole, shop drawings shall be reviewed to identify proper pick-up points for unloading, storage and erection procedures. A thru-hole shall be provided at the proper pick-up point for the purpose of inserting a steel bar to act as a stop to the cable choker when erecting the pole.

C. Provide a 3/4" x 10' copperweld ground rod, 2'-0" minimum from the base of each pole. Provide #2 copper grounding conductor through pole base to grounding lug inside of pole base.

D. Step bolts, safety cable, and internal wiring shall be installed while the pole is in a horizontal position on the ground. If the service platform is to be attached prior to erection, the pole tip shall be supported to prevent undesirable deflection.

E. Pole Foundations shall extend below grade as recommended by manufacturer and industry standard practices into load bearing soil. Refer to soils report.

F. Provide all necessary electrical distribution, disconnect switches, fuse blocks, fuses, cables, cable supports, etc. for a complete installation.

G. Coordinate pole conduit coupling locations and sizes as required for mounting pole base external disconnect. Disconnect switch and fuse enclosure shall be mounted near the

bottom of the sports lighting pole with minimum 2-inch threaded coupling, two per enclosure, top and bottom. Provide all necessary hubs.

3.2 WARRANTY

A. The pole system manufacturer shall provide a warranty of at least (5) years covering all components of the system from date of substantial completion. The first year of the warranty will be parts and labor to rectify any problems in the operation of the system under normal conditions. The following four (4) years will be to provide parts only to replace any defective parts at no additional cost to the Owner. This includes, but is not limited to, the replacement of poles, internal components to the pole, service platforms, and internal wiring of the service platform.

END OF SECTION

SECTION 27 01 00

OPERATION AND MAINTENANCE (O&M) MANUALS
OF COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Compile product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare operating and maintenance data as specified in this Section and as referenced in other sections of specifications.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit three (3) electronic copies, on separate devices (USB Flash Drive or some type of pre-approved solid-state storage device), of complete O&M manuals in final form. The submitted manual shall be the system manufacturer’s operations manual, supplemented with operations and maintenance instructions custom tailored for the system installed. Electronic documentation shall be provided in a non-proprietary PDF format, without password restrictions.

D. Hard copies shall be provided upon request of the Owner, Architect, and/or Consultant.

E. Recorded video of all training sessions shall be included in each copy, of each system’s final submitted O&M.

F. The final submitted manual shall include a sing-in sheet and owner/consultant signed acceptance of all training sessions.

1.2 ELECTRICAL OPERATING AND MAINTENANCE MANUAL SUBMITTAL SCHEDULE

A. Thirty (30) days after receipt of reviewed submittals bearing the Project Technology Consultant’s stamp of acceptance (including re-submittals), submit for review, an electronic copy of the first draft of the System’s O&M Manual. This copy shall contain as applicable to the specific system, a minimum of the following:
   1. Table of Contents for each element
   2. Contractor information
   3. All shop drawings, coordination drawings and product data, bearing the Project technology Consultant’s stamp of acceptance.
   4. All parts and maintenance manuals for items of equipment
   5. Warranties (without starting dates)
   6. Certifications that have been completed; submit forms and outlines of certifications that have not been completed
   7. Operating and maintenance procedures.
   8. Form of Owner's Training Program Syllabus (including times and dates)
   9. Control operations / equipment wiring diagrams
   10. Coordination Drawings
   11. Schedule of Speakers, Amplifiers, Sound Equipment, Etc.
   12. Schedule of Handsets and other Peripheral Devices, Etc.
   13. Schedule of Cable, Jacks, Outlets, Etc.
   14. Access Control Door Schedules
   15. Video Surveillance Camera Schedules
   16. Other required operating and maintenance information that are complete.
   17. Cable pathway layout drawings and station map, including through wall and floor penetration locations and sleeve sizes.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit the electronic completed manuals (hard copies upon request) in final form to the Project’s Technology Consultant.
   1. Prior to substantial completion for Owner's use after the Owner accepts facility maintenance.
   2. Include all specified data, test reports, drawings, dated warranties, certificates, training

videos. along with other materials and information.

D. The Project's Technology Consultant shall review the manuals for completeness within 15 days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Project's Technology Consultant. The manuals will not be retransmitted.

F. Electronic and/or hard copies of the accepted manuals shall be delivered to the Owner prior to substantial completion.

PART 2 - PRODUCTS

2.1 BINDERS

A. Upon the request for hard copies of the O&M manuals, the binders shall consist of the following configuration:
1. Commercial quality black, 3-ring binders with clear, durable, cleanable plastic covers.
2. Minimum ring size: 1"; Maximum ring size: 3".
3. When multiple binders are used, correlate the data into related groupings.
4. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 SYSTEM OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals Submitted in Hard Copy Format:
1. Prepare data in form of an instructional manual for use by Owner's personnel.
2. Format:
a. Size: 8-1/2" x 11"
b. Text: Manufacturer's printed data or neatly typewritten.
3. Drawings:
a. Provide reinforced punched binder tab and bind in text.
b. Fold larger drawings to size of text pages.
4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
a. Title of Project
b. Identity of separate structures as applicable
c. Identity of general subject matter covered in the manual.
6. Binder as specified

B. Content of Manual:
1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
a. Contractor, name of responsible principal, address and telephone number
b. A list of each product required to be included, indexed to content of the volume.
c. List with each product, name, address and telephone number of:
1) Subcontractor or installer
2) Maintenance contractor as appropriate
3) Identify area of responsibility of each.
4) Local source of supply for parts and replacement
d. Identify each product-by-product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
a. Include those sheets pertinent to the specific product.
b. Annotate each sheet to:
1) Identify specific product or part installed.
2) Identify data applicable to installation.
3) Delete references to inapplicable information.
3. Drawings:

a. Supplement product data with drawings as necessary to illustrate:
   1) Relations of component parts of equipment and systems
   2) Control and flow diagrams
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
c. Do not use Project Record Documents as maintenance drawings.

4. Written text as required to supplement product data for the particular installation:
   a. Organize in consistent format under separate headings for different procedures.
   b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued
   a. Provide information sheet for Owner's personnel, giving:
      1) Proper procedures in event of failure
      2) Instances that might affect validity of warranties or bonds
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems
1. Content for each unit of equipment and system as appropriate:
   a. Description of unit and component parts:
      1) Function, normal operating characteristics, and limiting conditions.
      2) Performance curves, engineering data and tests.
      3) Complete nomenclature and commercial number of replaceable parts.
   b. Operating procedures:
      1) Start up, break-in, routine / normal operating instructions
      2) Regulation, control, stopping, shut down and emergency instructions
      3) Special operating instructions
   c. Maintenance procedures:
      1) Routine operations
      2) Guide to trouble-shooting
      3) Disassembly, repair and reassembly
      4) Alignment, adjusting and checking
      5) Routine service based on operating hours
   d. Manufacturer's printed operating and maintenance instructions.
   e. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
   f. Complete equipment field accessible wiring diagrams
   g. Each Contractor's coordination drawings
   h. Other data as required under pertinent sections of the specifications
2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications
4. Provide complete information for products specified in Division 27.
5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.
8. Provide training report and certificates.

END OF SECTION

SECTION 27 05 00

COMMUNICATIONS BASIC MATERIALS, METHODS, AND GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of Division 01 General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 27 Communications.

B. Applicable provisions of this section apply to all sections of Division 27, Communications.

C. The general provisions of the Contract and the requirements of the following Sections apply to the Work specified in this Section. See following sections for related general and specific requirements following sections shall associate with this specification as applicable.
1. Division 26 in its entirety.
2. Division 27 in its entirety.
3. Division 28 in its entirety.

D. The entire drawing and specification package apply to the work specified in the communication specifications and shall be complied with in every respect. The Contract Documents are comprised of the drawings and specifications. The Contractor shall examine these Contract Documents, and coordinate required work indicated in each.

1.2 CODES AND STANDARDS

A. All equipment and work performed shall comply with current and applicable Codes, Standards, Rules, Ordinances, Regulations, and Best Practices (both published and best practices) as well as any other authorities that may have lawful jurisdiction pertaining to the work specified. None of the terms or provisions of this specification shall be construed as waiving any of the rules, regulations, or requirements of these authorities (including those not specifically listed in this Specification). Applicable Codes and Standards shall consist of, but not be limited to the following:
1. Americans with Disabilities Act (ADA)
2. Authorities Having Jurisdiction (AHJ) - Local
3. American National Standards Institute (ANSI)
4. American Society of Testing and Materials (ASTM) *Communications Cables - B694, B736, D4565, D4566, D4730, D4731, D4732*
5. Building Industry Consulting Services International (BICSI)
6. Code of Federal Regulations - Title 47
7. Electronics Industries Association (EIA) *Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices - EIA-455 Series*
8. Federal Communications Commission (FCC) - Communications Act and FCC Rules
9. Federal Information Processing Standards (FIPS) *Federal Building Standard for Telecommunications Pathways and Spaces - FIPS PUB 175, FIPS PUB 176*
10. The Insulated Cable Engineers Association (ICEA) *Communications Cable Stands - P-47-434, S-56-434, S-80-576, S84-608, S-85-625, S-86-634, S-87-640, S-89-648, S-90-661, S-98-688, S-99-689, S-100-685*
11. International Electro-technical Commission (IEC)
12. Institute of Electrical and Electronic Engineers (IEEE) *Local Area Networks/Metropolitan Networks Standards Collection - LAN/MAN 802 Series*
13. International Organization for Standardization (ISO) (ISO/IEC) *Premise Wiring Core and LAN/MAN Core Equivalents-11801, 8802, 14763-1*
14. International Telecommunication Union (ITU-T) *Telecommunications Standardization*
15. National Electrical Code (NEC) *National Electrical Code - NFPA 70*
16. National Electrical Contractor's Association (NECA) *Standards of Installation*
17. National Electrical Manufacturers Association (NEMA) *Performance Standard for Twisted Pair Premise Voice and Data Communications Cable-WC 63.1, WC 63.2, WC 66*
18. National Electrical Safety Code (NESC)
19. National Fire Protection Association (NFPA) - *National Fire Alarm Code NFPA 72, Life*

Safety Code NFPA 101

20. Society of Cable Telecommunications Engineers (SCTE)
21. Local Accessibility Standards
22. Telecommunications Industries Association (TIA) *(ANSI/TIA/EIA) Wiring and Cabling Standards - 526, 568, 569, 570, 571, 598, 606, 607, 758, TSB 31-B, 63, 67, 72, 75 and 95*
23. Uniform Building Code (UBC)
24. Underwriters Laboratories, Inc. (U.L.) - *497A, 910, 1077, 1863, 1283, 1459, 1604, 1651, 1681, 1690, 1778, 1977*

B. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

C. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

D. Obtain all permits required.

1.3 SUMMARY

A. The work covered by the specifications includes furnishing materials, labor, transportation, tools, permits, fees, utilities, and incidentals necessary for the complete installation of work required in the Contract Drawings.

B. It is the intent of the Contract Documents to provide a new and/or an extension of the existing installation, as shown in the associated specifications and drawings, complete in every respect.

C. Provide complete and working Communications Systems including equipment, conduit, wiring, material, labor and training as described in this Specification and the Drawings. The Communications Systems Drawings and Specifications are the sole property of the Architect and are not to be duplicated, scanned, loaned or in any way made available to persons not designated as authorized by the Architect. All Communications Systems plans, and specifications are to be returned to the Architect following completion of bid.

1.4 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A specialist in this field and have the personnel, experience, training, and skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than ten (10) systems of comparable size and type that have served their Owners satisfactorily for not less than 3 years.
3. Perform work by persons qualified to produce workmanship of specified quality. Persons performing work shall be required to be licensed. Onsite supervision shall have minimum of the following:
    a. Licenses, as applicable to the system being installed
    b. Manufacturer's Certifications
        1) Firm Certification
        2) Installer Certification
        3) Programmer's Certification
        4) System Designer Certification.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

B. If variations or departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Consultant for review. No departures shall be made without prior written acceptance of the Consultant.

C. Should the drawings or specifications disagree in themselves or with their counterpart, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Consultant in writing, shall be performed or furnished. In the case that the specifications should not fully agree with the Schedules, the latter shall govern. Figures indicated on drawings govern scale measurements and large-scale details govern small scale drawings.

D. The approximate locations of system equipment and components are indicated on the Drawings. These Drawings are not intended to give complete and accurate details in regard to location of equipment, field devices, etc. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the Review of the Owner or Consultant, who reserves the right to make any reasonable changes in the locations indicated without additional cost to the Owner.

E. Items specifically mentioned in the Specifications but not shown on the Drawings and/or items shown on Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

F. Any discrepancies between the Contract Documents and actual job site conditions shall be reported to the Owner or Consultant, so that they will be resolved prior to the bidding, where this cannot be done at least 7 working days prior to bid; the greater or costlier of the discrepancy shall be bid. All labor and materials required to perform the work described shall be included as part of this Contract.

G. It is the intention of this Section of the Specifications, and associated drawings, to outline minimum requirements to furnish the Owner with a turnkey and fully operating system in cooperation with other trades.

H. The contract documents are schematic in nature in that they are only to establish scope and a minimum level of quality. They are not to be used as actual working construction drawings. The actual working construction drawings shall be the shop drawings accepted by project’s consultant.

I. The Contractor shall be responsible for coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with the existing site conditions, details of the work and the working conditions, and verify dimensions in the field. The Contractor shall advise the project’s consultant of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor's site visit; coordination of existing conditions and include consideration for existing conditions.

J. These documents are conceptual in nature. It shall be the responsibility of the approved installer to furnish a complete and functional system, including the items shown on the drawings, in the specifications, and items not designated in either. The installer’s shop drawings and product data submittals shall represent a complete system and documents accepted by the project’s consultant shall not relieve the installer from being required to provide any materials, equipment, or labor to furnish a complete and functional system as recognized by the Project’s Technology Consultant and the Owner.

1.6 BUILDING CONSTRUCTION AND LAYOUT OF WORK

A. General: It shall be the responsibility of the Contractor to consult the Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The drawings are diagrammatic in nature and do not show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of all codes, ordinances, and standards; as well as all structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in closed ceiling space and/or furred chases unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.

C. The approximate location of equipment items is indicated on the drawings. Exact locations are to be determined by coordination of dimensions from approved equipment submittals and site-verified field measurements and will in all cases be subject to the approval of the Consultant. The Consultant reserves the right to make any reasonable changes in the indicated locations prior to installation for no additional cost.

D. In areas of existing special ceiling construction, the removal and restoration must be carefully planned such that the existing condition of the ceilings is maintained. It may be necessary for the Contractor to procure a Subcontractor familiar with this work to achieve this requirement.

E. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.7 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements. Extend electrical services and final connections to all items requiring same.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Where cabling pass through walls or floors, metal sleeves shall be provided and shall be sealed to prevent spread of fire and smoke. In walls, they shall extend 3” beyond the finished surface. In pipe chases, they shall extend 8” inches above floor slab and be cemented in a watertight manner. Size of these sleeves shall be at least as required to maintain a maximum 40% conduit fill ratio.1/2 inch greater than outside diameter of the conduit.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under other Division. Determine from the General Contractor / Construction Manager for the various trades, the Owner, and by direction from the Architect / Engineer, the exact location of all items. The construction trades involved shall furnish all roughing-in drawings and wiring diagrams required for proper installation of the electrical work.
   1. Make final connections to all communications equipment indicated on the drawings, except as noted.

F. Request all Shop Drawings required in ample time to permit proper installation of all electrical provisions.

G. Extend services as indicated to the various items of equipment furnished by others. Rough-in for the various items and make final connections ready for operation upon placing of the equipment.

1.8 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is defined as hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is defined as open to view, in plain sight.

1.9 GUARANTEE

A. Guarantee work for a minimum of two years or as noted longer elsewhere from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.10 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph

specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.11 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, and judged objectionable by the Owner, Architect, or Engineer, rectify such conditions at no additional cost to the Owner. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.12 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 27 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer shall be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before proposal due date. Submit complete design and performance data to the Architect. The Architect and Owner issue approvals of acceptable manufacturers as addenda to the Construction Proposal Documents.

B. Where acceptable manufacturers are listed, only products of those manufacturers may be provided. Additionally, the product must meet all the detailed requirements of the specifications.

C. If no manufacturer’s name is mentioned, the Contractor shall provide equipment and material which meet the specifications.

1.13 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work:
1. Obtained from utility maps and other substantially reliable sources.
2. Are offered separate from the Contract Documents as a general guide only without guarantees to accuracy.

B. Examine the site and verify the location and elevation of all utilities and of their relation to the work. Existing utilities indicated on the site plans are for reference only and shall be field verified by the Contractor with the respective public or private utility.

1.14 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

B. It is the responsibility of the Contractor to compare the scale of all electrical drawings with the scale of the architectural drawings and make adjustments to all electrical drawings which have the incorrect drawing scale so that his material takeoffs are not in error due to an incorrectly labeled drawing scale and his proposal is complete.

1.15 ABBREVIATIONS AND DEFINITIONS

A/V	Audio/Visual
AWG	American Wire Gauge
BCR	Building Communications Room
CATV	Cable Antenna Television
CCTV	Closed Circuit Television
CMP	Communications Media Plenum
CMR	Communications Media Riser
dB	Decibel
EMI	Electromagnetic Interference
ER	Equipment Room
FACP	Fire Alarm Control Panel

FCR	Floor Communications Room
Gbps	Giga Bits Per Second
Hz	Hertz
IC	Intermediate Cross-connect
IDF	Intermediate Distribution Frame
IM	Information Management
IS	Information Systems or Information Services (also see MIS)
IT	Information Technology
Km	Kilometer
LCD	Liquid Crystal Display
LED	Light Emitting Diode
M	Micron
MATV	Master Antenna Television *(A.K.A. Main Antenna Television)*
Mbps	Mega Bits Per Second
MC	Main Cross-connect
MDF	Main Distribution Frame
MHz	Megahertz
MIS	Management Information Systems or Services
NEXT	Near-End Cross Talk
nm	Nanometer
OFN	Optical Fiber Non-conductive
OFNP	Optical Fiber Non-conductive Plenum
OFNR	Optical Fiber Non-conductive Riser
OTDR	Optical Time Domain Reflectometer
PBX	Private Branch Exchange
POS	Point of Sale
PSELFEXT	Power Sum Equal Level Far-End Cross Talk
PSNEXT	Power Sum Near-End Cross Talk
SMATV	Satellite Main Antenna Television
TC	Telecommunications Closet *(Now referred to as TR)*
T.O.	Telecommunications Outlet
TR	Telecommunications Room *(A.K.A. TC - Telecommunication Closet)*
UTP	Unshielded Twisted Pair Wire

Definitions:

Administration Subsystem - Cable, connectors, cross-connect and inter-connect hardware, patch cords, and other equipment that allows easy reconfiguration of the telecommunications system to accommodate personnel and floor plans changes.

Campus Backbone Subsystem - Connects telecommunications processing equipment in different buildings on the same campus.

Communications Cabling - Any fiber optic, copper, coaxial or other transmission media used for transmitting or receiving communications systems data.

Communications System - Communications Systems and associated wired or wireless interconnection.

Communications Drawings - All floor plans, elevations, details, schematics, block diagrams, legends, tables, notes or attachments associated with any or all of the Communications Systems.

Distribution Cable - The telecommunications UTP wiring between the telecommunications room and the outlet connectors.

Equipment Subsystem - Telecommunications cable, connectors, support hardware, blocks, and protective devices that serve to connect the network interface and the backbone subsystem through the administrative subsystem.

Horizontal Subsystem - Telecommunications cable, outlets and distribution cords that extend the

riser backbone from the administrative points in the TRs to workstations.

Information Systems - Software systems including operating systems, programs, data manipulation and management systems, control software and various forms of proprietary and off-the-shelf software.

Information Technology - The practical application of knowledge associated with designing, installing and maintaining the equipment, hardware and infrastructure utilized for control, distribution, or display of telecommunications, audio, video and data signals. Because computers are central to information management, computer departments within companies and universities are often called (IT Departments) and are responsible for MIS or IS personnel and services.

Low Voltage Wire - Wire or cable used for one or more systems that operate on 24 volts or less. Low Voltage Wire is used to install and interconnect one or more of the Communications Systems. Low Voltage Wire includes patch cords, jumpers and all portions of cable or wire used to make the Communications Systems operational or for system communications.

Management Information Systems - A class of software that provides managers with tools for organizing and evaluating their department. Typically, MIS systems are written in COBOL and run on mainframes or minicomputers. Within companies and large organizations, the department responsible for computer systems is sometime called the MIS department. Another name for MIS is Information Services (IS).

Multiplexer - A communications device that multiplexes (combines) several signals for transmission over a single medium. A multiplexer is sometimes called a "mux". A demultiplexer is required to complete the process by separating multiplexed signals from a transmission line. Frequently a multiplexer and demultiplexer are combined into a single device capable of processing both outgoing and incoming signals.

Riser Backbone Subsystem - Telecommunications cable, splice enclosures, and associated hardware that provide the main cable routes in a building. It interconnects building floors and larger areas of a single floor. It also interconnects administrative points in satellite TRs to the administrative points in the building main equipment room.

Station Cable - The wiring between the outlet connections and the work area equipment.

Communications Systems - One or more of the following and associated equipment: Data/Networking Systems, Telecommunications Systems, Paging / Intercom Systems, Clock/Control Systems, Master Antenna Television Systems, Cable Antenna Television Systems, Broadcast Video Systems, Audio/Visual Presentations Systems, Microwave/Wireless Systems.

Telecommunications - The transmission, emission or reception of signs, signals, images, sound or intelligence of any nature by wire, radio, optical or other technical transmission system.

Work Area - Location of an employee or student and their data/telecommunications equipment or devices.

Work Area Subsystem - Station mounting cords, extension cords, connectors, adapters, and interface units that provide physical and electrical connectivity between workstation equipment and the horizontal subsystem.

1.16 QUALITY ASSURANCE

A. Equipment Standards:
   1. System and all components shall be brand new stock from manufacturer.
   2. All electronics shall be 100% solid state.
   3. System and all components shall bear a UL Label.

B. Contractor Qualifications:
   At the time of Proposal, the Contractor shall:
   1. Have manufactured, supplied or installed at least three (3) other systems of similar size,

complexity, and general operation as the systems described in these specifications. The Contractor shall furnish in writing to Architect proof of compliance with this paragraph at the time of proposal.

2. Hold all legally required Texas State Contractor's licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. The Contractor shall submit copies of licenses to the Architect prior to the start of work
3. Hold all legally required state registrations to meet local requirements for submittal drawings.
4. Have a local office within fifty (50) miles of the project site staffed with factory trained technicians who have experience on systems of similar complexity and function as the systems described in these specifications. These technicians shall be fully capable of system engineering support, installation supervising, system start-up, and providing the Owner with training and service on both hardware and software for the systems specified.
5. Certify complete and total compliance with the provisions of these specifications by letter or submittal of the proposal response forms, signed by an officer of the corporation, or a principal if other ownership currently exists. In addition, the letter or forms shall include a complete listing of exceptions, if any.

1.17 SUBMITTALS

A. Provide SUBMITTALS according to Division 01 and the following.

B. Requirements:

1. Submit paragraph-by-paragraph specification review indicating compliance or deviation with explanation.
2. Submit proof that all system components and cables are U.L. Listed.
3. An equipment list with names of manufacturers, model numbers, and technical information on all equipment proposed. Clearly mark exact model number proposed to be installed.
4. Product technical information sheets for each principal component in the proposed system, including cable, wire, terminal marking, and wire marking material.
5. Certification from the manufacturer stating that the system Contractor is an authorized distributor or installer of the proposed system when such certifications exist.
6. A statement listing every technical and operational parameter wherein the submitted equipment varies from that which was originally specified. If the submitter fails to list a particular variance and his submittal is accepted but is subsequently deemed to be unsatisfactory because of the unlisted variance, the submitter shall replace or modify such equipment at once and without cost to the Owner.

1.18 EXAMINATION OF SITE

A. The Contractor shall have visited the site and familiarized himself with all existing conditions prior to submitting his proposal and shall be prepared to carry out the work within the existing limitations. Failure or neglect to do so shall not relieve the Contractor of his responsibilities not entitle him to additional compensation for work overlooked and not included in his proposal.

B. The Contractor shall confirm the availability of the proper power source for each piece of specified equipment, through site visits and Drawings as necessary. Where proper power does not exist, the Contractor shall provide the required power, circuits, outlets, conduits, and wire as specified under Division 26.

1.19 DATA ACCURACY

A. Absolute accuracy of information regarding existing conditions cannot be guaranteed. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, elevations, etc., shall be governed by actual field conditions. Where variations from the contract documents are required, such variations shall be approved by the Architect / Owner.

1.20 SECURITY

A. The Contractor is responsible for complying with all of the Owner's and facility security's

requirements to prevent theft or damage to equipment, tools and materials. If any deviation from facility security requirements is necessary, approval for such deviation shall be coordinated with the Owner.

B. The Contractor shall not disclose any confidential information of the Owner. The Contractor acknowledges that such action is highly injurious and can do damage to the Owner. The Contractor will agree to and comply with the standard policies and provisions of the Owner regarding outside Contractors and Consultants.

1.21 UTILITIES

A. It shall be the responsibility of the Contractor to provide all temporary connection and cables, lighting, light stands and power. The facilities shall be used in accordance with all applicable regulations regarding operations, safety and fire hazards of the governmental Authorities Having Jurisdiction, provided they are not used in a wasteful manner.

1.22 PERMITS

A. All permits required for the specified performance and completion of the work shall be secured by the Contractor. These permits shall be presented and reviewed at the initial project progress meeting.

1.23 NOTIFICATION

A. The Contractor shall not shut off any existing systems. The Contractor shall give the Owner at least ten (10) calendar day's notice of any requirements to shut off or interference with existing alarm, regulating, computer or other service systems. The Owner will arrange and execute any shutdown. All work such as splicing, connections, etc., necessary to establish or re-establish any system shall be completed by the Contractor in close coordination with the Owner.

1.24 INTERFERENCES WITH THE OWNER

A. Transportation and storage of materials at the facility, work involving the facility, and all other matters affecting the habitual use by the Owner of its buildings, shall be conducted so as to cause the least possible interference, and at times and in a manner acceptable to the Owner. The Contractor shall make every effort to delivery equipment per the schedule required by the project.

1.25 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various major and minor feeders, equipment, and other pertinent items, as installed. Record underground and under-slab cables installed, dimensioning exact location and elevation of such installations.

B. At conclusion of project, obtain without cost to the Owner, electronic AutoCAD 2014 or later / Revit CAD files of the original drawings and transfer as-built changes to these. Provide the following as-built documents including all contract drawings regardless of whether corrections were necessary and include in the transmittal: "2 sets of CDs and prints for Owner's use, one set of CDs, prints, and mylars for Architect / Engineers Records". Delivery of these as-built electronic, reproducible and prints is a condition of final acceptance.
   1. 3 sets of electronic AutoCAD (2014 dwg or later) / Revit CAD drawing files, on CD-ROM media, of each contract as-built drawing.
   2. One reproducible Dayrex mylar film positive of each contract as-built drawing.
   3. Three sets of blue or black-line prints of each contract as-built drawing.

C. As-Built Drawings should indicate the following information as a minimum:
   1. Indicate all addendum changes to documents.
   2. Remove Engineer's Seal, name, address, and logo from drawings.

3. Mark documents AS-BUILT DRAWINGS.
4. Clearly indicate: DOCUMENT PRODUCED BY:
5. Indicate all changes to construction during construction. Indicate actual routing of all conduit and cables, etc that were deviated from construction drawings.
6. Indicate exact location of all underground communications raceways, and elevations.
7. Correct schedules to reflect (actual) equipment furnished and manufacturer.
8. During the execution of work, maintain a complete set of Drawings and specifications upon which all locations of equipment, devices, and all deviations and changes from the construction documents in the work shall be recorded.
9. Exact location of all communications equipment in building. Label panel schedules to indicate actual location.
10. Exact location of all communications equipment in and outside of the building.
11. Location, size and routing of all communications cables, conduits, equipment, etc. shall be accurately and neatly shown to dimension.
12. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
13. Cloud all changes.

1.26 OPERATING TESTS

A. After all communications systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect / Engineer and Owner. Provide minimum 24-hour advance notice of scheduling of all tests. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.27 WARRANTY

A. All equipment shall be covered for the full manufacturers warranty period and systems shall be warranted by the Contractor for a period of two years commencing with the filing date of substantial completion. The Warranty shall cover all costs for warranty service, including parts, labor, prompt field service, pick-up, transportation, delivery, reinstallation, and retesting. A contract for service shall cover the period starting with the first expected activation of each system and shall continue without interruption to cover the period to the end of the two-year warranty as defined above. The end of the warranty period shall be handled such that a smooth transition to a maintenance agreement with the Owner shall be achieved with no lapse in coverage.

B. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.28 BUILDING CONSTRUCTION

A. It shall be the responsibility of the sub-contractor to consult the Architectural and Engineering drawings, details and specifications and thoroughly familiarize himself as to the construction and all job-related requirements. All construction trades shall cooperate with the General Contractor / Construction Manager job site superintendent and lay out work so that all piping, cables, pathways, raceways, and other items are placed in the walls, furred spaces, chases, etc., so that there shall be no delay in the job.

1.29 TEMPORARY FACILITIES

A. General: Refer to Division 01 for general requirements on temporary facilities.

B. Temporary Wiring: Temporary power and lighting for construction purposes shall be provided under Division 26. Installation of temporary power shall be in accordance with NEC Article 305.

C. Temporary facilities, wire, lights and devices are the property of this Contractor and shall be removed at the completion of the Contract.

1.30 EXTRA MATERIALS

A. Keys: Provide three (3) sets of all keys for system cabinets.

PART 2 - PRODUCTS

2.1 WORK INCLUDED

A. All materials listed in PART 2 - PRODUCTS of this Division Sections and on the Drawings shall be provided by the Contractor unless specifically excluded or modified in other portions of this Specification or Addendums.

2.2 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

A. Materials, in general, shall conform to the National Electrical Code requirements and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the UL label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped testing agency, indicating that the items have been tested in accordance with required procedures, and that the materials and equipment comply with all Contract requirements.

2.3 STANDARD PRODUCTS

A. Materials and equipment shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications and shall essentially duplicate materials and equipment that have been in satisfactory use at least two (2) years prior to bid opening. Where custom or special items are required, these shall be fully described using drawings, material lists, etc., which fully describe in detail the item proposed for use on this project.

2.4 MANUFACTURE'S INSTRUCTIONS

A. The Contractor is responsible for furnishing the proper Communication equipment and/or material and for seeing it is installed as intended by the manufacturer. The Contractor shall, wherever necessary, request advice and supervisory assistance from equipment manufacturers as required for the proper installation, operation, or start-up. The Contractor shall notify the Consultant, in writing, of any conflict between the Contract Documents and the manufacturer's recommendations and shall obtain, from the Consultant, instructions/direction before proceeding with the work. The Contractor shall pay for all costs resulting from deficiencies created by installation not in accordance with the manufacturer's recommendations or the instructions of the Consultant.

2.5 RUST PREVENTION

A. Metallic materials shall be protected against corrosion. Exposed metallic parts of equipment exposed to the elements shall be given a rust inhibiting treatment and standard finish by the manufacturer. Components such as boxes, bodies, fittings, guards, and miscellaneous parts shall be protected in accordance with the ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.6 STORAGE AT SITE

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust, or physical damage.

B. All electronic equipment, containing sealed lead acid batteries or gel cells, shall be stored in climate-controlled area until installed or reinstalled. Do not store in non-climate controlled connex storage units.

C. Storage is to be provided and secured by the contractor. In the event that the Owner should agree to furnish storage space, security of the space and its contents shall remain the responsibility of the

contractor.

2.7 CONDITION OF MATERIALS

A. All materials required for the installation of the Communication systems shall be new and unused. Any material or equipment damaged in transit from the factory, during delivery to premises, while in storage on premises, while being installed, or while being tested, until time of final acceptance, shall be replaced by this Contractor without extra cost to Owner.

2.8 NAMEPLATES

A. Factory assembled components and equipment shall be provided with be factory stamped labeling. Labeling will have information required to specifically identify the component and/or equipment in the future such as the manufacturer's name, catalog number, serial number, etc. All data on the labels shall be legible at the time of final inspection.

2.9 ACCESS DOORS

A. Wherever access is required in walls or ceilings to concealed junction boxes, pull boxes, equipment, etc., installed under this Division, furnish a hinged access door and frame with flush latch handle to another Division for installation. Doors shall be as follows:
1. Plaster Surfaces: Milcor Style K.
2. Ceramic Tile Surfaces: Milcor Style M.
3. Drywall Surfaces: Milcor Style DW.
4. Install panels only in locations approved by the Architect.

2.10 SPACE LIMITATIONS

A. Equipment shall be chosen which shall properly fit into the physical space provided and shown on the drawings, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearances in accordance with applicable codes and standards. Physical dimensions and arrangement of equipment shall be subject to the approval of the Consultant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. This project has a critical path, which must be closely followed in order to meet the completion date. The Contractor shall review the proposed schedule at the Award of Contract meeting and be prepared to staff his work force according to the schedule constraints presented at that time.

B. Aesthetics are an important consideration in this installation. All components shall be installed so as to have aesthetically pleasing results as determined by the Owner and Architect. Actual locations of all visible components shall be coordinated in advance with the Owner and Architect.

C. Install, make fully operational and test the system as indicated on the Drawings and in the Specifications. Where information is not available the worst-case condition must be assumed to ensure a complete, functional system.

D. Any interfacing with other systems shall be the Contractor's responsibility under this contract, and the details, both logical and physical, of such interfaces shall be reflected in the Submittals and As-Built drawings.

E. If appropriate, interfaces with the Owner's Data Network, Telecommunications and Communications System shall be coordinated with the Owner and Architect.

F. All necessary back boards, back-boxes, pull-boxes, connectors, supports, conduit, cable and wire shall be furnished and installed to provide a complete and reliable system. Exact location of all backboards, boxes, conduit and wiring runs shall be presented to the Owner / Architect for approval in advance of any installation. Provide as required and as specified in Division 26.

G. Where required provide 120-VAC, 60 Hz power from nearest electrical panel through a junction box, to the system devices. Provide as required and as specified in Division 26.

H. Where required, install conduit, cable and wire parallel and square with building lines, including raised floor areas. Conduit fills shall not exceed 40%.

I. Ground busses shall be provided in each any room with communication equipment.

J. All equipment shall be mounted with sufficient clearance to minimize EMI as well as meet all applicable codes and facilitate observation and testing. Securely hand and/or fasten with appropriate fittings to ensure positive grounding, free of ground loops, throughout the entire system. Units shall be installed parallel and square to building lines.

K. Communications grounding system shall be a single point grounding from the building entrance electrical ground to each Communications room.

L. All Conduit systems, cabinets' racks, cable trays, protector blocks, SCTP patch panels and/or miscellaneous equipment, etc. shall be grounded by being connected to the common communications grounding system. The conductors shall be a # 6awg solid with a green jacket

M. Quiet and vibration-free operation of all equipment is a requirement of this installation. Properly adjust, repair, balance or replace any equipment producing objectionable (in the judgment of the Owner or Architect) noise or vibration in any of the occupied areas of any building and provide additional brackets and bracing if necessary. Any such additions or changes shall be at no additional cost to the Owner.

N. Installation shall comply with the CODES AND STANDARDS portion of this Section. Where more than one code or regulation if applicable, the more stringent shall apply.

O. Where new equipment is replacing old equipment, the Contractor is responsible for removing and disposing of the old equipment and doing whatever repair work is necessary as specified by the Owner / Architect.

P. Install firestopping, as specified in Division 26 for all penetrations in slabs and firewalls to meet code at the completion of work and prior to final testing demonstration to the Owner.

Q. The installation shall be performed in a professional manner.

R. On a daily basis, clean up and deposit in appropriate containers all debris from work performed under the appropriate specification sections. Stack and organize all parts, tools and equipment when not being used.

S. Preparation, handling and installation shall be in accordance with the Manufacturer's written instructions and technical data appropriate to the product specified.

T. All work shall conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

U. At the conclusion of the installation, all work areas, including all enclosures and boxes, shall be vacuumed and cleaned to remove all debris and grease.

3.2 COORDINATION WITH OWNER / ARCHITECT

A. Close coordination with the Owner / Architect is vital to achieve a complete, aesthetically pleasing job. The Contractor shall ensure that the Owner / Architect is kept fully apprized of job progress.

3.3 CUTTING, PAINTING, AND PATCHING

A. Structural members shall not be drilled, bored or notched in such a manner that shall impair their structural value. Cutting of holes in structural members, if required, shall be done with core drills

and only with the specific approval of the Owner / Architect for each instance.

B. All walls that require cutting or repair during the installation process shall be returned to their original condition, including the matching of colors and finishes to the satisfaction of the Owner / Architect, and at no additional cost to the Owner.

3.4 WIRE AND CABLE

A. All low voltage cable shall be low smoke plenum rated, limited energy, with 300-volt insulation.

B. All wires in exposed areas shall run through conduit as specified in Division 26.

C. Provide conduits, cable trays, raceways, wireways, boxes and outlets as specified in Division 26.

D. After installation, and before termination, all wiring shall be checked and tested to insure there are no grounds, opens, or shorts on any conductors. In addition, all wires between buildings or underground and all coax cables shall have insulation tested with a megohmmeter (megger) and a reading of greater than 20 megohms shall be required to successfully complete the test.

E. Run wires continuously from termination to termination without splices.

F. Wire and cable shall be supported in each equipment and terminal cabinet and in each terminal and pull box in vertical risers and horizontal runs with wire duct and strap-type supports. At any point where wire duct is required for good wire management, whether shown on elevations or not, install appropriate duct. Where terminal boards are used, wire ducts shall be supplied on both sides and at not rime shall wires cross over terminal boards. Arrange cables neatly to allow inspection, removal and replacement. Lace cables as required. Spot tie wire bundles with plastic cable ties and securely affix to panels. If screw type terminals are specified, terminal strip connections shall be locking, tongue style, pressure crimp, and solderless spade lug.

G. Visually inspect wire and cable for faulty insulation prior to installation. Protect cable ends at all times with acceptable end caps except during actual termination. At no time shall any coaxial cable be subjected to a bend less than a 6-inch radius. Protect wire and cable from kinks. Install 1 pull rope for all 2” or larger sized conduits.

H. Provide plastic bushings and strain relief material at all conduit exit points and where necessary, to avoid abrasion of wire and excess tension on wire and cable.

I. Cables above accessible ceilings shall not rest on ceiling tiles. Use Velcro tie wraps, J-hooks or D-rings to hold cables. Provide independent support for all cables. Support is to be from building structure (do not support from pipes or conduits). Communications cables shall not tie off on HVAC supports, all-thread, ceiling grid hanger wire or electrical / mechanical piping system.

J. Ground and bond equipment and circuits in accordance with NEC and Division 26.

3.5 IDENTIFICATION AND TAGGING

A. All cables, wires, wiring forms, terminal blocks and terminals shall be identified by labels, tags to other permanent markings in accordance with TIA/EIA-606. The markings shall clearly indicate the function, source, or destination of all cabling, wiring and terminals. All cables and wires shall be identified, utilizing heat-shrink, machine printed, polyolefin wire markers (Brady Type B-32 *or equal*). Handwritten tags are not acceptable.

B. Should a situation arise where the wire tagging format as shown on the drawings cannot be used, a substitute format shall be submitted which complies with the intent to provide documentation that will permit end-to-end tracing of all Communications Systems wiring.

C. All panels shall be provided with permanently attached engraved lamacoid labels with identifying names and functions. All terminal points shall be appropriately labeled. Labels shall be consistent in form, color, and typeface throughout the system and all must contain the name of the system or subsystem as part of the label textual information. Design, color, font and layout shall be

coordinated with, and approved by, the Owner.

D. Identification of Equipment:
1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Take care not to obliterate this nameplate. The legend on all nameplates or tags shall correspond to the identification shown on the Operating Instructions.
2. A black-white-black 3 layer laminated plastic engraved identifying nameplate shall be permanently secured to each wireway, terminal cabinet, and communications (voice, data, video) cabinet or rack.
   a. Identifying nameplates shall have 1/2-inch high, engraved letters. For equipment designation and ¼-inch letters indicating source circuit designation, (i.e.: “IDF(FCR) XXYY –served from MDF (BCR) XXGG).
3. Permanent, waterproof, black markers shall be used to identify each communications grid junction box, clearly indicating the type of system available at that junction box.
4. Pull Boxes: Field work each with a nameplate showing identity, and identifying equipment connected to it. Nameplates shall also indicate where pull box is fed from.
5. Communication hardware located above accessible ceilings: Provide ½-inch high black name plate with white 1/4-inch letters glued to bottom of t-grid ceiling below hardware located above ceiling. Identification shall be as short as possible yet identifying device above ceiling, i.e. “A/V-EQ”.

E. Prohibited Markings: Markings intended to identify the manufacturer, vendor, or other source from whom the material has been obtained are prohibited for installation in public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters Laboratories), and approval labels are exceptions to this requirement.

F. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of communications facilities. Provide text of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with industry standards for color and design.

G. Wire and Cable Labeling: Provide wire markers on each conductor in all boxes, pull boxes, gutters, wireways. Identify with drop/circuit number.

H. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch wide plastic tape, colored red or orange with suitable warning legend describing buried communications lines. All underground conduits shall be so identified. Tape shall be buried at a depth of 6-inches below grade and directly above conduits or ductbanks. Provide magnetic marking tape below all underground conduits.

3.6 CUTTING AND PATCHING

A. General: Comply with the requirements of Division 01 for the cutting and patching of other work to accommodate the installation of electrical work. Except as authorized by the Architect / Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.

3.7 INSTRUCTION OF OWNER'S PERSONNEL

A. Before proceeding with the instruction of Owner Personnel, prepare a typed outline in triplicate, listing the subjects that will be covered in this instruction, and submit the outline for review by the Owner. At the conclusion of the instruction period obtain the signature of each person being instructed on each copy of the reviewed outline to signify that he has a proper understanding of the operation and maintenance of the systems and resubmit the signed outlines.

B. Prior to substantial completion, conduct an on-site training program to instruct Owner's operating personnel in the operation and maintenance of the communications systems.
1. Provide the training during regular working day.
2. The Instructors shall be experienced in their phase of operation and maintenance of the

systems and with the project.

C. Time to be allocated for instructions.
The Contractor shall furnish the services of factory trained specialists to instruct the Owner's operating personnel. The Owner's operator training shall include training as specified per system specification,
1. Minimum of four (4) hours dedicated instructor time
2. 2-hour sessions on different, non-consecutive days
3. Additional instruction time for specific systems as specified in other Sections.

D. Before on-site training, submit the program syllabus; proposed time and dates; for review and approval, minimum 48 hours prior to proposed training time and date.
1. One copy to the Owner
2. One copy to the Architect / Engineer

E. The Owner shall provide a list of personnel to receive instructions and shall coordinate their attendance at the agreed upon times.

F. Use operation and maintenance manuals as the basis of instruction. Review manual with personnel in detail. Explain all aspects of operation and maintenance.

G. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shut down of each item of equipment.

H. Demonstrate equipment functions (both individually and as part of the total integrated system).

I. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

J. Submit a report within one week after completion of training. List time and date of each demonstration, hours devoted to the demonstration, and a list of people present, with their respective signatures.

K. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

L. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.8 OPENINGS

A. Framed, cast or masonry openings for boxes, equipment or conduits are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.9 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions, which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether

or not such existing facilities are shown.

3.10 VANDAL RESISTANT DEVICES

A. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used.

B. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.11 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

B. Do not deliver equipment to this project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather shall be rejected, and the contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

3.12 EQUIPMENT BACKBOARDS

A. Backboards: ¾ inch, fire retardant, exterior grade plywood, painted gray, both sides.
1. Provide minimum of two 4-ft. by 8-ft. sheets of plywood for each location shown.
2. Provide minimum of two 4-ft. by 4-ft. sheets of plywood for each communications location.

3.13 SITE MANAGEMENT RESPONSIBILITY

A. The Contractor shall provide an on-site Project Manager as defined in CONTRACTOR'S QUALIFICATIONS portion of this Section.

3.14 DEMOLITION AND RELOCATION

A. The Contractor shall modify, remove, and relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain as directed by the Owner. Materials and items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to the approval of the Owner. The Contractor may substitute new materials and items of like design and quality in lieu of materials and items to be relocated, if approved by the Owner.

B. All items scheduled for relocation and/or reuse shall be inspected by the Contractor and the Owner or his authorized representative. A written report of the condition of each item shall be made and provided to the Consultant. Where items scheduled for relocation and/or reuse are considered unsuitable for reuse, the Contractor shall so notify the Consultant and await reinstallation instructions before proceeding with removal. Items damaged in reinstallation shall be repaired or replaced by the Contractor as directed by the Owner at no additional cost to the Owner or the Consultant.

C. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean, repair, and provide all new materials, fittings, and appurtenances required to complete the relocation and to restore the items to good operative order. All relocations shall be performed by workmen skilled in the work ad in accordance with standard practice of the trades involved.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points as indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or connections into the existing facilities in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction

period shall not be interrupted without prior specific written approval of the Consultant.

3.15 EXISTING SYSTEM TESTING

A. Contractor shall have each low voltage system tested prior to the commencement of construction. Systems shall include all systems that fall under the Division 27 umbrellas, as identified in the Division 27 of the Construction Specifications Institute (CSI) current Master Format . Test shall include the functionality of all field devices and equipment. Any failures or items found to be functioning not to specification, shall be reported prior to construction. Any items found to be improperly or non-functioning upon the completion of the project, shall be replaced and/or repaired, by the contractor, at no additional cost to the project or the owner.

B. Contractor shall document the location and any ID tag, MAC address, IP address, or bar code of any existing device that is to be removed from its current location. Devices that are to remain, shall be reinstalled in the exact location that they reside in prior to construction, unless noted otherwise.

C. Any individual/firm that will be removing, relocating, reinstalling, or tampering with any devices; shall be licensed by the state and certified by the manufacturer of the system.

D. Contractor shall remove any devices where construction occurs to prevent possible damage to the device. Removal of any devices which support user connection or other systems, shall be coordinated with the owner prior to removal and/or taking offline.

3.16 START-UP RESPONSIBILITY

A. The Contractor shall initiate System operation. The Contractor shall provide competent Start-Up personnel on each consecutive working day until all Communications Systems are functional and ready to start the acceptance test phase. If the Contractor, in the Owner / Architect's judgment, is not demonstrating progress in solving any technical problems, the Contractor shall supply Manufacturer's factory technical representation and diagnostic equipment at no cost to the Owner, until resolution of those defined problems. Where appropriate, the Contractor shall bring the Systems on-line in their basic state (i.e., alarm reporting, facility code access control, etc.) It is the responsibility of the Owner to provide the specific database information that will be utilized for initial system programming.

B. Properly ground each piece of electronic equipment prior to applying power. Properly ground all shielded wire shields to the appropriate earth ground at the hub end only, not at the remote or device end.

C. Use a start-up sequence that incrementally brings each portion of the system on-line in a logical order that incorporates checking individual elements before proceeding to subsequent elements until the entire system is operational. The basic steps should include:
   1. Establish ground planes at the equipment rooms and hub end of the systems as specified in Division 26.
   2. Disconnect power, connect the first device, reconnect power, and verify operational correctness. Repeat until the entire system is verified and operational.

3.17 PREPARATION FOR ACCEPTANCE (SUBSTANTIAL COMPLETION)

A. All systems, equipment, and devices shall be in full and proper adjustment and operation, and properly labeled and identified.

B. All materials shall be neat, clean and unmarred, and parts securely attached.

C. All extra material as specified shall be delivered and stored at the premises as directed.

D. Test reports of each system and each system's components and As-Built Project Drawings shall be complete and available for inspection and delivery as directed by the Owner.

3.18 SYSTEM ACCEPTANCE REQUIREMENTS

A. Before final acceptance or work, the Contractor shall perform and/or deliver each of the following in the order stated.

B. The Contractor shall deliver three (3) composite “System Operations and Maintenance” manuals in three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain in appropriately tabbed sections:
   1. A statement of Guarantee including date of termination and the name and phone number of the persons to be called in the event of equipment failure.
   2. A set of Operating procedures for the overall System that includes all required Owner activities, and that allows for the Owner operation of all attributes and facilities of the System.
   3. A section for each specific type of equipment containing the vendor manuals, instruction sheets, and any related literature that cam in the original shipping container for that piece of equipment. Include all warranty cards.

C. Testing:
   1. The Contractor shall perform all tests required by Division 26 and those submitted as part of this Section.
   2. The Contractor shall activate all devices for proper system operation, including supervisory and trouble circuit tests. Similarly, audible alarms will not be activated except on a one-time, coordinated basis, to check the actual sounding devices.
   3. A test report for each piece of equipment shall be prepared by the Contractor and submitted to the Owner. This report shall include a complete listing of every device, the date it was tested, by whom and the results. The final test reports shall indicate that every device tested successfully. Failure to completely test and document the tests will result in a delay of final testing and acceptance.

D. As-Built Drawings:
   1. After completion of all the tests listed above, and prior to the final acceptance test, The Contractor shall submit the complete As-Built drawings as identified in PART 1 – PROJECT RECORD DRAWINGS.
   2. The final As-Built Drawings shall consist on one set of reproducible prints, two (2) sets of Point-to-Point Detail Drawings, Equipment Schedules, and the complete detailed technical data that was shipped by the manufacturer with all installed equipment.

E. Final Acceptance Test: The Final Acceptance Test shall demonstrate the installed and activated System’s performance and compliance with System Specifications. However, before this testing can begin the following must have received and reviewed by the Owner.
   1. System Operations and Maintenance Manuals
   2. System Test Reports
   3. As-Built Drawings

3.19 FINAL ACCEPTANCE

A. The date of final acceptance shall be the date of owner occupancy, or the date all punch list items have been completed or final payment has been received. Refer to Division 1 for additional requirements

B. When the Final System Acceptance Requirements described above including the Final Acceptance Test described above have been satisfactorily completed. The Owner / Architect shall issue a Letter of Completion to the Contractor indicating the date of such completion. The Notice of Completion shall be recorded by the Contractor upon receipt of the Owner / Architect completion letter. This date of record shall be the start of the warranty period.

END OF SECTION

SECTION 27 05 05

COMMUNICATIONS ALTERATIONS PROJECT PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Inspection and service of existing equipment and materials to remain or be reused.

B. Handling of equipment and materials to be abandoned.

C. Handling of equipment and materials to be removed.

1.2 QUALITY ASSURANCE

A. Coordination with the Contractor prior to the disconnection or shutdown of existing equipment, or to the modification of existing operational systems.

1.3 CONTRACT DRAWINGS

A. There is the possibility that there are existing conditions and devices which are affected by the work indicated on the drawings and called for in the specifications (project manual) which do not appear on the drawings. It is the Contractors responsibility to visit the site and determine all of the existing conditions and to take these existing conditions into consideration when making and presenting a proposal to as to have a complete proposal.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Material used to upgrade and repair existing equipment shall conform to that specified.

B. Material used to upgrade and repair existing equipment shall not void existing warranties or listings of the equipment to be upgraded or repaired.

C. Material used to upgrade and repair existing equipment shall be new and shall be of the same manufacturer of the existing equipment, shall be acquired through the existing original equipment manufacturer’s approved distribution channels, shall have manufacturer’s warranties for the new material being used, and shall be listed for the use intended.

PART 3 - EXECUTION

3.1 INSPECTION

A. Existing materials and equipment indicated on the drawings or in the specifications to be reused shall be inspected for damaged or missing parts. Notify the Architect / Engineer, in writing, accordingly.

B. If using materials specified or shown on the drawing voids or diminishes the warranty or operation of remaining equipment or systems, the Contractor shall notify the Architect / Engineer, in writing.

C. Verify field measurements and circuiting arrangements.

D. Verify that abandoned wiring and equipment serve only abandoned facilities.

E. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect before disturbing existing installation.

3.2 APPLICATION

A. Existing materials and equipment indicated on the drawings or in the specification to be reused

shall be cleaned and reconditioned, including tightening of feeder and bus bar lugs prior to installation and reuse in the modified system.

B. Material and equipment removed that is not to be salvaged for Owner's use or for reuse on the project shall become the property of the Contractor and shall be removed from the site.

C. Prior to start of construction, Contractor shall walk areas to be renovated with Owner to identify and document items to be salvaged for Owner’s use.

D. Material or equipment salvaged for Owner's use shall be carefully handled and stored where directed by the Owner.

E. Materials and equipment not indicated to be removed or abandoned shall be reconnected to the new system.

F. Clean and repair existing materials and equipment that remain or are to be reused.

3.3 SEQUENCING AND SCHEDULING

A. Coordinate utility service outages with Architect and Owner.

B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

C. Remove and replace existing conduit, wiring, outlets, devices, and appurtenances as occasioned by new or remodeled construction. Re-establish service to devices that may be interrupted by remodeled construction.

D. Disconnect communication systems in walls, floors and ceilings scheduled for removal. When outlets are removed, wire shall be pulled out of the conduit back to the nearest remaining box or cabinet.
1. Remove exposed conduit that has been abandoned.
2. Cap conduit beyond the finish line.

E. Remove equipment, systems, conductors, wiring, raceways, etc. abandoned or not required for existing or new systems. Coordinate with Architect / Owner for salvage by Owner.

F. Existing Telephone System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and Telephone Company at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

G. Existing Paging and Sound Reinforcement Systems: Maintain existing system in service. Disable system only to make switchovers and connections. Notify the Owner at least 24 hours before partially or completely disabling system. Minimize outage duration.

H. Existing Data Network: Maintain existing system in service. Disable system only to make switchovers and connections. Notify the Owner at least 24 hours before partially or completely disabling system. Minimize outage duration.

I. Existing Video Distribution System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify the Owner at least 24 hours before partially or completely disabling system. Minimize outage duration.

3.4 DEMOLITION AND EXTENSION OF EXISTING COMMUNICATION WORK

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner’s

representative unless they are not wanted, then it will be the responsibility of this Contractor to remove such items and properly dispose of them. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon approval of the Owner's representative substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore them to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner's representative to such items and receive further instructions before removal. Items damaged in repositioning operations are the contractor's responsibility and shall be repaired or replaced by the contractor as approved by the owner's representative, at no additional cost to the Owner.

D. Conduit and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner's representative. Conduit and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Construction Inspector. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities that must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner's representative hereinbefore specified.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove communication devices and equipment serving utilization equipment that has been removed.

G. Repair adjacent construction and finishes damaged during demolition and extension work.

H. Maintain access to existing communication installations that remain active. Modify installation or provide access panel as appropriate.

I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.5 PROTECTION OF THE WORK

A. Provide adequate temporary support and auxiliary structure as necessary to ensure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of work from damage.

C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

D. Repairs, equipment replacements, and corrections to special systems due to damage caused by contractor:
   1. For each special system, a manufacturer certified contractor and certified technicians shall perform corrective measures to each system component that was functional prior to demolition and renovation and found defective or non-functional within 14-days prior to estimated date of substantial completion.
   2. Corrective measures to the special systems to correct components of the special systems found damaged by the contractor shall be completed to the satisfaction of the Owner and Architect prior to acceptance of substantial completion at no additional cost to the Owner.

3.6 TESTING AND CORRECTIVE MEASURES FOR DAMAGE DURING CONSTRUCTION IN EXISTING LOW VOLTAGE SYSTEMS

A. Pre-construction testing of existing low voltage systems:
   1. Provide a complete operational test of the following systems prior to demolition and renovation. Verify operation of each circuit, device, panel, console, distribution equipment, and associated accessories. Test shall be preformed by a contractor and technicians, each certified by the respective manufacturer of the existing special system to perform test, programming, and repairs to the respective manufacturer's system. Testing of the existing system shall include all areas served by the existing system including but not limited to the main campus, remote buildings, and temporary buildings:
      a. Paging System.
      b. Telephone System
      c. Data Network Communications System
      d. Video Distribution System
   2. Provide a complete written report to the Architect, indicating any deficiencies of the existing system in relation to each component's intended function. Include in the written report evidence of current certification by the respective manufacturer for the contractor and individuals performing the tests. Provide the written report within 14 days of notice to proceed and prior to any demolition or renovation work.

B. Substantial completion testing of existing special systems:
   1. Provide complete operational test of the following systems within 14-days prior to estimated date of substantial completion. Verify operation of each circuit, device, panel, console, distribution equipment, and associated accessories. Test shall be preformed by a contractor and technicians each certified by the respective manufacturer of the existing system to perform test, programming, and repairs to the respective manufacturer's system. Testing of the existing system shall include all areas served by the existing system including but not limited to the main campus, remote buildings, and temporary buildings:
      a. Paging System.
      b. Telephone System
      c. Data Network Communications System
      d. Video Distribution System
   2. Provide a complete written report to the Architect, indicating any deficiencies of the existing system in relation to each component's intended function. Include in the written report evidence of current certification by the respective manufacturer for the contractor and each individual performing the tests. Provide the written report within 14 days of expected date for substantial completion.

END OF SECTION

SECTION 27 05 07

COMMUNICATIONS SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 01 and as outlined below.

B. Submit product data shop drawings only for the following and for items specifically requested elsewhere in the Contract Drawings and Specifications. Architect / Engineer reserves the right to refuse shop drawings not requested for review and to imply that materials shall be provided as specified without exception.

C. The term submittal, as used herein, refers to all:
1. Shop Drawings
2. Coordination Drawings
3. Product data

D. Submittals shall be prepared and produced for:
1. Distribution as specified
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relation to adjacent or critical features or work or products.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: 1/4"=1'-0".

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each room containing technology equipment and each rack with technology equipment, submit plan and elevation drawings. Show:
1. Actual technology equipment and components to be furnished.
2. NEC working space and NEC access to NEC working space.
3. Relationship to other equipment and components and openings, doors and obstructions
4. Rack location and dimensions

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Verify location of communications station devices, telephone outlets and other work specified in this Division.
1. Coordinate with drawing details, site conditions and millwork shop drawings prior to installation.
2. Where required for clarification, submit shop drawings prior to rough-in and fabrication.

F. Submit shop drawings in plan, elevation and sections, showing outlets and other devices in casework, cabinetwork and built-in furniture.

1.4 PRODUCT DATA

A. All product options specified shall be indicated on the product data submittal. All options listed on the standard product printed data not clearly identified as not part of the product data submitted shall become part of the Contract and shall be provided.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer / Owner (Does Not Comply, Explanation:)

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up and adjusting.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Manufacturer's catalog numbers
4. Conformance with requirements of Contract Documents

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect / Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect / Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
1. Proper sizes and capacities
2. That the item will fit in the available space in a manner that will allow proper service
3. Construction methods, materials and finishes

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
1. Shop Drawings and Coordination Drawings: Submit four opaque reproductions.
2. Product Data: Submit the number of copies the contractor requires, plus those to be retained by the Architect / Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
1. Date
2. Project title and number
3. Contractor's name, address and telephone number
4. The number of each Shop Drawing, Project Datum and Sample submitted
5. Other pertinent data

D. Submittals shall include:
1. The date of submission
2. The project title and number
3. Contract Identification
4. The names of:
   a. Contractor
   b. Subcontractor
   c. Supplier
   d. Manufacturer
5. Identification of the product
6. Field dimensions, clearly identified as such
7. Relation to adjacent or critical features of the work or materials
8. Applicable standards, such as ASTM or federal specifications numbers
9. Identification of deviations from contract documents
10. Suitable blank space for General Contractor and Architect / Engineer stamps
11. Contractor's signed and dated Stamp of Approval

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
1. Finishes which involve Architect / Engineer selection of colors, textures or patterns
2. Associated items requiring correlation for efficient function or for installation

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
1. The related specification section number
2. The exact specification section title

B. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make resubmittals under procedures specified for initial submittals.
1. Indicate that the document or sample is a resubmittal
2. Identify changes made since previous submittals

B. Indicate any changes which have been made other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and Architect / Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect / Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect / Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT / ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect / Engineer will:
1. Review identified submittals with reasonable promptness and in accordance with schedule. Specific equipment submittals that may be required to be expedited shall be submitted separately without other submittal items not requiring the same prompt attention.
2. Affix stamp and initials or signature, and indicate requirements for resubmittal or approval of submittal
3. Return submittals to Contractor for distribution or for resubmission

B. Review of submittals will not extend to design data reflected in submittals that is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Division 1.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SHOP DRAWINGS AND PRODUCT DATA

A. Submittals shall not be combined or bound together with any other material submittal.

B. Submit individually bound shop drawings and product data for the following when specified or provided:
1. Structural Cabling
2. Communications System
3. Sound Reinforcement System
4. CATV System

3.2 COORDINATION DRAWINGS

A. Submit coordination drawings as specified.

END OF SECTION

SECTION 27 05 09

CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions, mock-ups and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples; all exposed finishes shall be approved by the Architect / Engineer. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide a manufacturer’s qualified personnel to observe:
1. Field conditions.
2. Condition of installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Testing and adjusting of equipment.

B. Manufacturer’s qualified personnel shall make written report of observations and recommendations to Architect/Engineer.

1.7 MOCK UPS

A. Assemble and erect the specified equipment and products complete, with specified anchorage and support devices, seals and finishes.

B. Do not proceed with any work involving a mock-up, until the related mock up has been approved in writing.

C. Acceptable mock-ups in place shall be retained in the completed work where possible.

D. Perform tests and submit results as specified.

1.8 SCHEDULING OF MOCK-UPS

A. Schedule demonstration and observation of mock-ups, in phases, with Architect / Engineer.
   1. Rough-in
   2. Finish with all appurtenances in place
   3. Demonstrations

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS.

PART 3 - EXECUTION

3.1 ADJUSTMENTS AND MODIFICATIONS

A. Contractor shall provide all adjustments and modifications as requested by the manufacturer's qualified personnel at no additional cost to Owner.

3.2 MOCK-UPS

A. Mock-up a typical classroom, science lab of each type, and computer lab with all wiring devices, cover plates, rough-in boxes, conduits, etc. Provide all conductors from all wiring devices to above ceiling space to demonstrate conduit routing and conductor fill.

END OF SECTION

SECTION 27 05 10

FIRESTOPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide firestop as required, and as specified. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

B. Types: Firestop required for the project includes smoke stop.

1.2 QUALITY ASSURANCE

A. UL Label: Firestops shall be UL labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Nelson.

B. 3M (Minnesota Mining Manufacturing).

C. Hilti

D. Specified Technologies, Inc.

2.2 MATERIAL AND COMPONENTS

A. General: Except as otherwise indicated, provide firestop manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by the manufacturer, and as required for installation.

2.3 FIRESTOP

A. Conduits: Provide a soft, permanently flexible sealant for 1-1/2 to 2 hour rated fireproofing for steel conduits (up to 4" diameter).

B. Low Voltage Cables, Fiber Optic Cable and Innerduct: Provide Specified Technologies, Inc. EZ-Path single, double, or triple pathways as required.

PART 3 - EXECUTION

3.1 INSTALLATION OF FIRESTOPS

A. General: Install firestops in accordance with the manufacturer's installation instructions and industry practices to ensure that the firestops comply with requirements. Comply with UL and NFPA standards for the installation of firestops.

END OF SECTION

SECTION 27 10 00

STRUCTURED CABLING SYSTEM (SCS)

PART 1 - GENERAL

1.1 RELATED WORK

The following, in their entirety and as applicable, shall apply to this section. Including any associated drawings.

A. Conditions of the Contract
B. Division 1
C. Division 26
D. Division 27
E. Division 28

1.2 DESCRIPTION

A. Summary of Work:
1. Reference Attachment ‘A’ of this specification for supplemental scope as it relates to the project and the Owner standards.
2. Provide a complete and tested Structured Cabling System (SCS) for the interconnections of the Local Area Network (LAN). The SCS shall include fully terminated unshielded twisted pair cables, fiber optic cabling, raceways, conduit, back boxes, copper/fiber optic termination components, station mounting hardware, fiber optic enclosures, patch panels, copper/fiber optic patch cables, relay cabinets/cabinets, and other incidental and miscellaneous premises wiring system hardware as required for a complete, tested, and usable system that is in compliance with the latest NEC, ANSI/EIA/TIA, BICSI, and Authorities Having Jurisdiction codes and standards. The installation shall comply with all applicable requirements, design guidelines, and standards in effect at the job site and as indicated in the Drawings and Specifications.
3. An IDF will be required when the distance between outlet terminations and MDF/IDF exceeds 280’, including service loops. IDF's shall be selected and organized to be minimum in number while still reaching all locations to be wired.
4. If there are any discrepancies between the drawings and specification or among themselves, the contractor shall request clarification prior to providing pricing for the scope of work. If a request is not issued and a response not provided via a posted addendum, the contractor shall provide pricing for the costliest scenario and obtain clarification during the project.
5. These documents are conceptual in nature. It shall be the responsibility of the approved installer to furnish a complete and functional system, including the items shown on the drawings, in the specifications, and items not designated in either. The installer’s shop drawings and product data submittals shall represent a complete system and documents accepted do not relieve the installer from being required to provide any materials, equipment, or labor to furnish a complete and functional system as recognized by the Project’s Technology Consultant and the Owner.

1.3 QUALITY ASSURANCE

A. Acceptable manufacturers:
1. The equipment/products described herein and furnished per these specifications shall be the product of one manufacturer or must be able to obtain the full warranty of the combined solution. All references to model numbers and other detailed descriptive data is intended to establish standards of design performance, and quality, as required. The contractor shall not deviate from the part numbers listed. Any deviation from specified part numbers will result in the removal of non-specified materials and reinstallation of approved materials at no cost to the project.
2. The approved manufacturers shall provide a complete End-to-End solution with the maximum product and performance warranty offered by the specified manufacturer.
3. Only products listed in Attachment ‘B’ or approved in compliance with the project manual’s approval requirements will be accepted.

B. Installer Qualifications:

1. The Data Cable System Installer shall be licensed and shall meet all applicable regulations of the State Department of Labor insofar as they apply to this type of system. The proposer shall be a firm normally employed in the low voltage and data cabling industry and shall provide a reference list of ten (10) large-scale projects and contact names confirming successful Structure Cabling System installations.
2. The SCS Installer shall be a Certified, local area, integrator of the manufacturer's product and must be able to provide the manufacturer's maximum available warranty for the solution on the entire SCS. The contractor's certification must have been obtained and held within 75 miles of the project's location.
3. The installing contractor must have a full-time employed RCDD (Registered Communications Distribution Designer) on staff. Current RCDD certification shall be provided in the product submittals.
4. All individuals installing the SCS must be employees of the certified installer and at least 25% of the installing staff shall have undergone a training class given by the manufacturer. Current certification indicating the successful completion of the training course shall be available upon request at the project and submitted in the contractor's product submittals.
5. The proposing contractor and the installing contractor must be the same company. No subcontractor to the proposing SCS contractor will be allowed for any portion of the SCS scope of work.

C. Low Voltage Meeting Requirements:
1. The successful Contractor shall attend a mandatory pre-construction meeting with the project's consultant individuals deemed necessary by the Owner's representative prior to the start of the work. No SCS work shall begin prior to this meeting.
2. The successful contractor shall attend a mandatory bi-weekly meeting to discuss the project progress to help aid coordination with the Owner and Other contractors.
3. Prior to the installation of any items required for this scope of work the contractor must provide a purchase order with a detailed material list for all materials to be installed. The purchase order is not required to show cost, but part numbers must be provided. The purchase order will be reviewed during one of the regularly scheduled low voltage meetings.

D. Acceptance: The Owner's representative reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

E. Warranty:
1. The selected system installer shall be a certified installing contractor of product and hold current certification. Contractor shall provide the specified manufacturer's maximum end-to-end performance warranty on all products installed. The proposer shall provide current certification documentation. The performance warranty shall be issued by the manufacturer and shall warrant that ALL cable links have been tested bi-directionally (end to end) using a Level IIIe or better tester, per TSB-67, and that all test results conform to the most current ANSI/TIA-568.2-D.
2. The warranty will also cover single mode fiber optic cabling. Performance testing shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, method B.
3. The warranty will stipulate that all products used in this installation meet the prescribed mechanical and transmission specifications for such products as described in ANSI/TIA/EIA-568.3-D. Quality and workmanship evaluation shall be solely by the Owner/Designer and designated representatives.

1.4 REGULATORY REQUIREMENTS

A. Standards: All work shall be performed in accordance with the latest revisions of the following standards and codes:
1. Latest Local Codes and Amendments
2. National Electrical Code, current version

B. Other References:
1. ANSI/TIA-568-C.0 – Generic Communications Cabling for Customer Premises...
2. ANSI/TIA-568-C.1 – Commercial Building Communications Cabling Standard Part 1: General Requirements.
3. ANSI/TIA 568-C.2 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards

4. ANSI/TIA 568-C.3 – Optical Fiber Cabling Components Standard
5. ANSI/TIA-568-C.4, Coaxial Cabling Component Standard
6. ANSI/TIA-569-C – Commercial Building Standard for Telecommunications Pathways and Spaces.
7. ANSI/ICEA S-83-596, Fiber Optic Premises Distribution Cable.
8. ANSI/TIA/EIA-598, Color Coding of Optical Fiber Cables
9. ANSI/ICEA S-87-640, Fiber Optic Outside Plant Distribution Cable.
10. ANSI/TIA/EIA-758: Customer-Owned Outside Plant Telecommunications Cabling Standard.
11. ANSI/TIA/EIA-526-7, Optical Power Loss Measurements of Installed Single mode Fiber Plant: OFSTP-7.
12. ANSI/TIA/EIA-526-14-A, Optical Power Loss Measurements of Installed Singlemode Fiber Plant: OFSTP-14A
13. ANSI/TIA/EIA-TSB-125, Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning
14. ANSI/TIA/EIA-TSB-140, Additional Guidelines for Field Testing Length, Loss, and Polarity of Optical Fiber Cabling Systems.
15. ANSI/TIA-606-B – Administration Standard for the Commercial Telecommunications Infrastructure
16. TIA/EIA-607-B - 2011 - Commercial Building Grounding and Bonding Requirements for Telecommunications
17. Institute of Electrical and Electronic Engineers (IEEE 802.xLAN)
18. TIA/EIA 942 Data Center Standards
19. Current BICSI Telecommunications Distribution Methods Manual
20. NFPA 70 – National Electrical Code (NEC).
21. BICSI – TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM).

C. Governing Codes and Conflicts: If the requirements of these specifications or the Project Drawings exceed those of the governing codes and regulations, then the requirements of these specifications and the Drawings shall govern. However, nothing in the Drawings or Specifications shall be construed to permit work not conforming to all governing codes, regulations, and manufacturer installation requirements.

1.5 ABBREVIATIONS

A. The following abbreviations are used in this document:

IDF	Intermediate Distribution Frame
MDF	Main Distribution Frame
UTP	Unshielded Twisted Pair
SCS	Structured Cabling System
RCDD	Registered Communications Distribution Designer

1.6 SUBMITTALS

A. Project Initiation: Within fourteen (14) days of Notice to Proceed, the data network system installer shall furnish the following in a single consolidated submittal:
1. Permits: The Contractor shall obtain all required permits and provide copies to the Owner / Architect / Engineer.
2. Product Literature: Complete manufacturer’s product literature for all cable, patch panels, cross-connect blocks, cable supports, cable labels, outlet devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner / Designer) and the manufacturer’s supporting documentation demonstrating compatibility with other related products shall be included. The submittal shall have some type of distinguishing marker or pointer to indicated what specific product is to be provided
3. Construction Schedule: A time-scaled Construction Schedule, using PERT/CPM, indicating general project deadlines and specific dates relating to the installation of the cable distribution system.
4. Testing: Proposed Contractor UTP cable test result forms, fiber optic cable test result forms and a list of instrumentation to be used for systems testing.
5. Specification Compliance: A letter shall be provided stating, by section and subsection, that

the SCS installer complies with the entire specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been approved by the Owner.

6. Each Submittal must have a detailed parts list with quantities.
7. Certifications: The contractor shall submit all certifications for approved products and the certifications must contain dates which are valid from the date of proposal and not expirer any sooner than 12 months after substantial completion of the project.
    a. BICSI RCDD Certification: This certification must be held by an on-staff, full-time employee of the SCS installer. The holder must be staffed out of the office that is located within 75 miles of the projected.
    b. Certifications must be obtained by the SCS installer's office that is located within 75 miles of the project and shall be a company certification, not and individual certification.
    c. Certifications must be held by at least 25% of the, on-site, staff and be made available at the site if requested by the owner, architect, and/or project's technology consultant.
    d. Fiber Optic Technician Certification: This certification must be held by the on-staff/on-site individual that is supervising the fiber optic installation and performing the fiber optic terminations and testing.

B. Shop Drawings: Submit the following items, for Owner review and approval, within twenty-eight(28) days of notice to proceed:
1. Proposed circuit routing and circuit grouping plan prepared by a BICSI certified RCDD (Registered Communications Distribution Designer). The RCDD certification must be current. Identifiable, separate routing shall be shown for both the station cabling and the MDF-to-IDF tie cabling.
2. In addition to the cable routing, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:
    a. Location of wall penetrations (all penetrations shall be sleeved and contain protective bushings at both ends)
    b. Location of sleeved wall pass-thru
    c. Size of sleeve at each location installed
    d. Quantity of cable passing through each sleeve
    e. Location of drops in each room (quantity or labeling of drops are not required in the submittal plans. Labeling shall be provided in the closeout plans and quantities shall be as per the contract documents, addendums, and issued changes. Each drop shall be labeled for the type of outlet that it is)
    f. Conduit routing, size, quantity, and stub-up locations for all floor mounted outlets.
3. Drawing Compliance: A letter shall be provided stating that the SCS installer complies with the entire project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been approved by the Owner.
4. All subcontractors shall provide submittals to general contractor for normal distribution to Architects, Engineers and the Owner's project managers.

C. At Substantial Completion: Provide drawings, to the Owner, to reflect installed cabling with correct labeling and cable routing.

D. Close-out Procedures: Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. Close out technology documents shall be separated from all other trade's documents. The close out finals shall include:
1. Inspection and Test Reports: During the course of the Project, the Contractor shall maintain an adequate inspection system to ensure that the materials supplied, and the work performed, conform to contract requirements. The Contractor shall provide written documentation that indicates that materials acceptance testing was conducted as specified. The Contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.
2. Provide complete test reports for all cabling and devices that comprise system as outlined in this document.

3. Include the Name, address and telephone of the authorized factory representative with a 24-hour emergency service number.
4. The manual shall also include Manufacturer's data sheets and installation manuals/instructions for all equipment installed a list of recommended spare parts.
5. Generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.
6. An up-to-date record ("as-built") set of approved shop drawing prints that have been revised to show each and every change made to the structure cabling system from the original approved shop drawings. Drawings shall consist of a scaled plan of each building showing the placement of each individual item of the technical cabling system equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
7. As-built Drawings shall include cable pathways, camera locations with correct labeling and MDF/IDF locations. A copy of the As-Built drawings reflecting the final locations of all cabling shall be given to the designated Owner's representative. The as-built drawings shall be prepared using AutoCAD 2012 or later. Provide the Owner with electronic versions of the as-builts on CD media.
8. All drawings must reflect final graphic numbering, point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.
9. A copy of the manufacturer's warranty on the installed system.
10. Any keys to cabinets and/or equipment and special maintenance tools required to repair, maintain, or service the system.
11. Operating and Maintenance Instructions for all devices within the system. These instructions shall reflect any changes made during the course of construction, and shall be provided to the Owner, for their use, in a three-ring binder labeled with the project name and description. (4 copies)
12. Upon completion of the work and at a time designated by the Architect or owner, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all included systems and equipment. Minimum amount of training time shall be at least 4 hours.
13. One (1) 30" x 42" laminated floor plan sheets illustrating technology drops and cable designation with final graphic numbering. Contractor shall provide one complete floor plan sheet for each telecommunications room (MDF or IDF)

PART 2 - PRODUCTS

2.1 GENERAL

A. Reference Attachment 'B' to this specification, which contains the minimum materials list for this specific project.

B. Installation: The cabling shall be installed per requirements of the manufacturer and the Project Documents utilizing materials meeting all applicable TIA/EIA standards. The Contractor is responsible for providing all incidental and/or miscellaneous hardware not explicitly specified below as required for a complete and operational system.

C. Materials: Materials shall be as listed or shall be approved equivalent products of other manufacturers meeting the intent and quality level of the TIA/EIA specifications.

D. Testing: All installed cabling shall be tested 100% good after installation by the Contractor. All final test results shall be delivered to owner at completion of project. Refer to closeout requirements.

E. Ratings: All products shall be new and brought to the job site in the original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's Laboratories label. All communications cable shall bear flammability testing ratings as follows:

CM	Communications Cable
CMP	Plenum Rated Communications Cable
CMR	Riser-Rated Communications Cable

F. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of the proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket that would indicate possible problems. Damaged cable or any other components failing to meet specifications shall not be used in the installation.

G. Cable Lubricants:
1. Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit.
2. Approved Products
   a. Twisted-pair cable: Dyna-Blue
   b. American Polywater

H. Fire Wall Sealant:
1. Any penetration through firewalls (including those in sleeves) will be resealed with an Underwriter Laboratories (UL) approved sealant.
2. Approved Products
   a. 3M or
   b. Pre-approved equal

2.2 DATA CLOSET (MDF/IDF) HARDWARE

A. Equipment Cabinets/Cabinets: Provide and install equipment cabinets and/or cabinets in locations indicated on the attached drawings for the following areas.
1. For all MDF/IDF locations: Contractor shall provide and install a new floor mounted cabinet/rack system or a wall mounted cabinet where indicated on plans. Refer to floor plan and enlarged MDF/IDF room layouts for number of cabinets/racks to provide at each location. If an enlarged detail is not available, the contractor shall provide the required number of racks to accommodate 100% of all termination components and an equal amount of owner equipment; as well as (1) spare rack. If an MDF/IDF is located in shared space, the contractor shall provide a floor supported, wall mounted cabinet system with all required doors and side panels to secure the equipment and termination components.

B. Distribution Cabinet/Cabinet Grounding: All Cabinets and/or Cabinets shall be grounded using stranded #6 AWG insulated copper conductor. Connect to service entrance grounding electrode. Provide all required bonding materials and hardware and bond to building grounding electrode subsystem at building electrical service entrance.

C. Fiber Optic Patch Panels:
1. The enclosures used shall provide termination panels for the specified type of connectors and be of sufficient size and capacity to terminate 110% of the fiber count of the inside of outside fiber optic cables. Patch panels must be 19” cabinet mountable. Provide all termination accessories, fiber patch cords, enclosures and test for a complete fiber optic distribution system.
2. Provide closet connector housing panels, size for 110% of total fiber count to be terminated.
3. ALL fiber strands must be terminated in fiber housing.

D. Patch Panels:
1. All patch cables shall be modular type patch panels to allow individual jacks to be inserted. All patch panels shall be fully populated with Jacks. Provide dust caps for all unused jacks. Furnish units that adhere to the performance requirements TIA/EIA-568A standards.
2. Provide cable support bars at the back of all patch panels to provide additional support at rear of panels. Provide one (1) support bar for each row of 24-ports. Support bars will not be required if the closet design consist of rear horizontal cable management above and below each patch panel.

E. Rack Electrical:
1. A power strip shall be installed vertical at the back of each data relay rack.
2. Project electrical contractor to provide and install one electrical receptacle for each UPS installed on the entire project. Coordinate receptacle type and location with the installed product requirements and the technology consultant prior to installation.

F. Cable Management Panels:

1. Provide cable management panels as required for vertical cable management on ends and in between all racks on entire project.
2. Provide Velcro straps for cable dressing in MDF/IDF rooms.

G. MDF/IDF Patch Cables:
1. Cabling Contractor shall provide owner with one (1) patch cable for each data drop on entire project. These cables will provide connectivity from the front of the network patch panels to the network equipment. The patch cables are to be terminated properly with RJ-45 connections on each end with the proper pin-out assignments per project configuration.
2. All patch cables shall be factory terminated. NO EXCEPTIONS.

2.3 CABLE ROUTING/PATHWAY

A. Cable Tray:
1. Metal cable tray shall be provided to affix to the top of all floor mount cabinets. Cable tray shall be used to brace cabinets to walls and to route cable from walls to cabinets in communication closets.
2. Contractor to provide and install all applicable installation accessories.

B. Cable Support System:
1. All low voltage cabling shall be installed and supported using an approved cable support system installed at 48” intervals unless installed in conduit. Do not exceed manufacturer’s recommendation for the quantity of cables supported in an individual support.
2. Cable supports shall not connect to any ceiling grid wire or on any support attached to the ceiling grid.
3. Cable supports shall not exceed a serviceable height of more than 5’, but no closer than 2’, above the finished ceiling.
4. Cable supports can be attached to vertical walls or the building’s structure.
5. If attached to the building’s structure, 3/8” threaded rod shall be utilized to extend down within the serviceable heights mentioned above. Grid wire hangers will not be accepted.

C. All cable bundles shall be grouped together using plenum rated Velcro for the entire run above and below the ceilings.

D. Conduit Bushings shall be installed prior to the installation of any cable. If cable is found to be installed without the bushing the cable will have to be removed and re-installed. No cut bushings will be accepted. If cable damage occurs during any portion of the installation, the cable will be removed and replaced at no cost to the project. This item will be strictly enforced and adhered too.

E. The projects electrical contractor shall provide and install all metallic conduit and backboxes indicated to be installed on the drawings. It is the SCS installer’s responsibility to coordinate all conduit requirements with the electrical contractor to ensure that all conduit sizes and locations are correctly installed. If box locations and conduit sizes are found to vary from the project documents after installation the SCS installer will bare all financial responsibility to ensure these items are installed correctly. The RCDD for the SCS will be responsible for ensuring conduit sizes are sufficient for cable count while maintaining a 40% fill ratio. If there is not electrical contractor on the project, the SCS Installer shall bear responsibility for the provision and installation of all required raceways.

2.4 STATION WIRING

A Wire: The data and voice wire provided for all outlets shall be four-pair, solid copper conductor, meeting the intent and quality level of the TIA/EIA-568 Commercial Building Wiring Standard.

B. Testing: The four-pair UTP cable must be UL Performance Level tested. Each 1000-foot spool must be individually tested with test results affixed to the spool. All cable must be provided on new 1000-foot spools. No shorts will be allowed.

C. Rating: Cable installed in conduit shall be non-plenum rated. Cable not installed in conduit shall be plenum rated if installed in plenum ceiling space, non-plenum rated otherwise.

D. All cable shall be routed to the center of the room in which it is serving and then route to the outlet location that it is intended for. Provide a 5’ service loop in the center of the room and 5’ service loop

at each workstation outlet properly supported above ceiling. All workstation service loops shall be made in figure eight configurations, no exceptions.

E. Provide minimum of 10’ service loop at all headend locations properly supported above ceiling.

F. Provide indoor/outdoor, plenum rated category cable at any outdoor data outlet or data outlets served by cabling that travels through subsurface conduit. This applies to station or horizontal cable runs only.

2.5 STATION HARDWARE

A. Information Outlet / Jack Modules:
1. Shall be high quality 8p/8c modular jacks with circuit board construction and IDC style or 110-style wire, T568B terminations. Jacks shall meet EIA/TIA TSB40 recommendations for connecting hardware
2. Shall be standard 8-position, RJ-45 Style, FCC compliant
3. Shall be designed for 4-pair, 100 Ohm balanced UTP Cable
4. Shall terminate 26-22 AWG solid or stranded conductors
5. Shall accept FCC compliant 6 position plugs.
6. Shall have attached wiring instruction labels to permit either T568A or T568B wiring configurations.
8. Shall meet or exceed transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA-568-C2, Transmission Performance Specifications for 4-Pair 100 Ohm.
9. Shall be UL Listed and CSA certified.
10. Each jack shall have category rating identified on the front face.

B. Faceplates:
1. Standard faceplates shall be a minimum of 4-port.
2. Wall mounted telephone faceplates shall be 1-port.
3. All faceplates shall be single gang.
4. All blank inserts color shall be coordinated prior to procurement.

C. Outlet Patch Cables: Cabling Contractor shall provide owner with patch cable for each data drop on entire project. Each cable will be terminated properly with RJ45 connections on each end with appropriate pin-out assignments per project configuration.
1. Cabling Contractor shall provide owner with patch cable for each data drop on entire project. Each cable will be terminated properly with RJ45 connections on each end with appropriate pin-out assignments per project configuration.
2. Patch cords shall be stranded copper, matching the category of the installed cable.
3. All patch cables shall be factory terminated. No exceptions

2.6 FIBER OPTIC PRODUCTS

A. Singlemode: Single mode fibers, each with a color-coded PVC tight buffer shall have a maximum attenuation of 1.0 dB/km at 1310 nm and 1.0 dB/km at 1550 nm.

PART 3 - EXECUTION

3.1 GENERAL

A. Fire Wall Penetrations: The contractor shall avoid penetration of fire-rated walls and floors wherever possible. Where penetrations are necessary, they shall be sleeved with metallic conduit and resealed with an Underwriter Laboratories (UL) approved sealant. Contractor shall also seal all floor, ceiling and wall penetrations in fire or smoke barriers and in the wiring closet.

B. Allowable Cable Bend Radius and Pull Tension: In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Refer to the cable manufacturers allowable bend radius and pull tension data for the maximum allowable limits.

C. Cable Lubricants: After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.

D. Pull Strings: Provide pull strings in all new conduits, including all conduits with cable installed as part of this contract. Pull test is not to exceed 200 pounds. Data and video cables can be pulled together with pull strings.

E. Conduit Fill shall not exceed 40%.

F. Damage:
1. The Contractor shall replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals and cable sheath removed too far (over 1-1/2 inches).
2. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.

G. Clean Up: All clean up activity related to work performed will be the responsibility of the Contractor and must be completed daily before leaving the facility.

H. Conduit and Back Boxes:
1. The Contractor shall ensure that the appropriate back boxes and conduits, for the project, are provided as required.
2. One (1) 1" conduit will be required each outlet that serves one to a maximum six (6) category 6 or a maximum of four (4) category 6 cables. Provide additional conduit for cable counts that exceed this number.
3. One (1) double gang deep box will be required for each technology outlet. All boxes except Presentation outlets will be required to have a single gang reducer ring.

3.2 EQUIPMENT CABINET CONFIGURATION

A. Equipment Cabinets: Equipment racks shall be assembled and mounted in locations shown on the Drawings and as detailed. Each rack shall be securely mounted to the floor and braced to the wall with cable tray in accordance with the manufacturer’s instructions and recommendations. Racks shall be mounted such that the side rails are plumb with vertical cable management panels. Racks to be located such that future expansion can occur without relocating existing racks. Racks shall be grounded in accordance with NEC requirements.

B. Wire Management Components: Horizontal cable management panels shall be installed directly above and below each patch panel. Vertical cable management panels shall be installed on each side of the cabinet.

C. Cable Placement: Cable installation in the Wiring Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance location. Avoid crossing area horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.

D. Cable Routing: Cable shall be routed as close as possible to the ceiling, floor or corners to ensure that adequate wall or backboard space is available for current and future equipment. All cable runs within the Wiring Closet shall be horizontal or vertical within the constraints of minimum cable bending radii. Minimum bend radius shall be observed. Cables shall not be tie-wrapped to electrical conduit or other equipment.

E. Installation: All incoming cables shall be routed on the cable tray and neatly dressed down to the patch panels. Cable bundles shall not exceed more than 48 cables to patch panel.

F. Hardware: Provide cabinet and jack panel hardware as required for all data station wiring.

3.3 STATION WIRING INSTALLATION

A. General:
1. Cabling between wiring closet and workstation locations shall be made as individual home runs. No intermediate punch down blocks or splices may be installed or utilized between the wiring closet and the communications outlet at the workstation location.
2. All cable must be handled with care during installation so as not to change performance

specifications. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable. There shall never be more than one and one-half inches of unsheathed UTP cable at either the wiring closet or the workstation termination locations.

3. All cable shall be routed to the center of the room in which it serves before routing to the outlet location and a 5’ service loop shall be provide. An addition 5’ service loop shall be provided above ceiling at the outlet location. All service loops shall be figure 8 loops.

B. Exposed Cable:
1. All cabling shall be installed inside walls or ceiling spaces whenever possible. Exposed cables and/or cables routing through mechanical rooms, electrical rooms, or restrooms shall be installed inside conduits, unless noted otherwise on the project drawings.
2. Additional exposed cable runs will require Owner approval and will only be allowed when no other options exist.
3. All cable routing through conduits and sleeves shall maintain a 40% maximum conduit fill ratio.

C. Placement: All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair the Owner’s efficient use of their full capacity.

D. Cable Routes:
1. All cabling placed in ceiling areas must be in conduit, or Panduit Corp. J-MOD modular cable support with Velcro cable wrap at each location. Cable supports shall be permanently anchored to building structure or substrates. Provide attachment hardware and anchors designed for the structure to which attached and that are suitably sized to carry the weight of the cables to be supported. Do not route cable through webbing of structural steel. Cabling must be supported in dedicated supports intended to support cabling as described in this section. Contractor shall adhere to the manufacturer’s suggested fill ratio for each size cable support installed. No support shall have more than 48 cables.
2. Attaching cable to pipes or other mechanical items is not permitted. Communications cable shall be rerouted so as to provide a minimum of 18 inches spacing from light fixtures, sources of heat, power feeder conduits and EMI sources. Cabling shall not be attached to ceiling grid support wires. Cable runs shall be routed down the corridors; parallel or perpendicular to building structure. Multiple cables to be bundled together at and between each cable support installed.
3. Contractor shall be responsible for coordinating with other trades on the project so that the installed cable pathway does not interfere with the installation of other systems to insure that mechanical ducts, pipes, conduits, or any other above ceiling systems are not putting unnecessary stress on any portion of the install SCS.
4. All (48) cable bundles shall be routed directly to the MDF or IDF that serves the area. All bundles shall remain separated for the length of the cable run.
   a. Provide data outlet for irrigation controllers. Coordinate location with landscape consultant.
   b. Provide data outlet for time clock appliance in main custodian office.
   c. Provide OSP or flooded/gel filled cat6 cable at any outdoor data outlet or data outlets served by cabling that travels through subsurface conduit. This applies to station or horizontal cable runs only.

3.4 STATION HARDWARE

A. Flush Mount Jacks shall be mounted in a faceplate with back box.

B. Placement:
1. Where possible, the communications outlet shall be located so that its centerline is 18 inches above floor level or 12 inches above permanent bench surfaces. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches.
2. Outlets shall be installed within 3’-0” of power outlets

C. RJ-45 Jack Pin Assignments:
1. Pin connections for data station cable outlets and patch panels shall match EIA/TIA 568 modular jack wiring recommendation T568B.

2. Pin connections at data jack panels shall match pin connections at outlets (straight through wiring)

3.5 CABLE TESTING REQUIREMENTS

A. Notification: The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.

B. Inspection: Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms and timetable for all copper and fiber optic cabling.

C. Procedures:
1. Trained personnel shall perform all testing. Acceptance of the test procedures discussed below is predicated on the Contractor's use of the recommended products and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.
2. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and submittal and approval of full documentation as described above. Tests with the "* PASS" (asterisk) will not be acceptable. These circuits must be repaired to meet "PASS".

D. Errors: When errors are found, the source of each shall be determined, corrected and the cable retested. All defective components shall be replaced and retested. Re-test results must be provided on Owner approved forms and witnessed by Owner.

E. Twisted Pair Cable Testing:
1. At a minimum, the Contractor shall test all station drop cable pairs from Data Closet termination patch panels to outlet device RJ45 jacks. Products shall be tested for compliance with ANSI/TIA/EIA 568A and ISO/IES 11801. Test equipment used shall meet TIA/EIA TSB-67, Level II accuracy. Further, the contractor shall have a copy of TSB-67 in their possession and be familiar with its contents.
2. Each wire/pair shall be tested at both ends for the following:
   a. Wire map (pin to pin connectivity)
   b. Length (in feet)
   c. Attenuation
   d. Near end cross talk (NEXT)
   e. Power Sum
3. Test equipment shall provide an electronic and printed record of these tests.
4. Test results for each four-pair UTP cable must be submitted with identification to match labels on all patch panel ports and RJ45 jacks and must match as-builts associated with that cable.

F. Fiber Optic Cable Testing:
1. Testing device for fiber optic cables shall be a high quality OTDR (Optical Time-Domain Reflectometer) equipped with a printer. The printed data shall show, in addition to any summary information, the complete test t0.and all relevant scale settings. The OTDR must have the capability to take measurements from bare fiber strands as well as SC connector terminations.
2. All fiber optic cable shall be tested on the reel before installation to ensure that it meets the specifications outlined herein.
3. After installation the Contractor shall test each fiber strand in accordance the EIA 455-171 Method D procedures (bi-directional testing) at 1550nm for single mode. A form shall be completed for each cable showing data recorded for each strand including length, total segment (end-to-end) loss (dB) and connector losses (dB) at each end. In addition, the printed data strip for each strand shall be attached to the form. Patch cables shall also be tested.
4. Acceptable fiber optic connector loss shall not exceed .75dB per mated pair. The Contractor is responsible for obtaining minimum loss in fiber connections and polishing per manufacturer specifications.
5. Singlemode: Single mode fibers shall have a maximum attenuation of 1.0 dB/km at 1310 nm and 1.0 dB/km at 1550 nm.

3.6 INSPECTION

A. Conformance to the installation practices covered above is to be verified when completed. In some cases, the Owner/Designer may inspect before acceptance.
   1. Written Test Report:
      a. Complete test results, including actual values associated with tests.
      b. Show all certifications for telecommunications wiring systems.
      c. Include cable maps showing each cable route and keyed to cable labels. Provide owner with complete floor plans identifying outlet location and cable routing drawing in AutoCAD format. Provide electronic copy of drawings to owner in AutoCAD version 2012 or greater.
      d. Documentation of outlet, cable and cabinet labeling system.

B. After performing all tests, tabulate results and bind together in format acceptable to Owner. Installer shall provide written certification in the test report that telecommunications cable is properly installed, and test results certify system to all specified standards.

ATTACHMENT 'A'

PROJECT SPECIFIC SCOPE OF WORK AND INSTRUCTIONS

PART 1 – SUMMARY OF WORK

1.1 DESCRIPTION OF WORK

A. The work includes provision and installation of a complete Cabling System (SCS) in compliance with these specifications and associated drawings, pre-proposal addenda, change orders, change directives and any other documents issued both pre-proposal and during the project.

B. The SCS Installer shall comply with all conditions of the contract and "Division 1 –General Requirements" as they apply to the SCS Scope of Work. It shall be the responsibility of the SCS Contractor to make themselves familiar with all documents.

C. It should not be assumed that any portions of a complete and functional system are to be furnished and/or provided by anyone, other than the SCS installer, unless specifically stated otherwise.

1.2 STRUCTURED CABLING SYSTEM – ADDITIONAL INSTRUCTIONS

A. Base Proposal:
1. The SCS Installer shall provide and install an End-to-End Structured Cabling System as per these specifications and associated drawings. The Base bid SCS shall consist of:
   a. Category 6 cable and connectivity to each Video Surveillance Camera, Voice/Data Outlet, IP Intercom Speakers, and any other locations requiring Local Area Network Connectivity.
   b. Category 6 cable and connectivity to each Wireless Access Points.
   c. Each connectivity solution be a complete Channel Solution; consisting of jacks, patch panel, and patch cables.
   d. Each channel solution shall be color coded to the system in which it serves.
2. The products specified in Attachment 'B' are to establish quality, functionality, color, and standards. The following shall be considered preapproved equivalent for each specific portion of the SCS.
   a. Category 6 copper cable
      1) Panduit (basis of design)
      2) Commscope
   b. Category 6 copper cabling, termination components, and patch cables
      1) Panduit (basis of design)
      2) Commscope
   c. Fiber Optic Cabling and Components:
      1) OCC
      2) Corning
   d. Metals (racks, cable managers, and cable tray):
      1) Hoffman
      2) Chatsworth
      3) B-Line
   e. Manufacturer approval request must be submitted in compliance with the Division 1 instructions and must be received no less than ten (10) business days prior to the posted proposal submission date. No substitutions will be allowed if not submitted per these instructions and approved via official pre-bid addendum.

1.3 COPPER PATCH PANELS

A. The SCS Installer shall provide and install patch panels as per the instructions below.
1. 24-port patch panels shall only be used for copper tie cables and demarcation extensions.
2. Provide dedicated, 48-port patch panels for each of the following system (reference color code chart for designated insert and patch panel color coding per system):
   a. LAN and IP Telephones
   b. Wireless Access Points
   c. IP Intercom
   d. Video Surveillance Cameras

1.4 COPPER AND FIBER OPTIC PATCH CABLE LENGTHS

A. The SCS Installer shall provide copper and fiber optic patch cables as per the instructions below. All patch cables shall be factory terminated and warrantied for the copper and fiber solutions specified.

1. MDF/IDF Copper Patch Cables:
   a. Patch cables shall be category 6
   b. Provide one patch cable for each port on the entire project
   c. Patch cables to be installed by network equipment installer/programmer
   d. Patch cable lengths
      1) 85% shall be 5’
      2) 15% shall be 7’
2. Work Area Outlet Copper Patch Cables:
   a. Patch cables shall be category 6
   b. Provide one patch cable for each port on the entire project
   c. Patch cables to be installed by the owner.
   d. Patch cable lengths
      1) 90% shall be 10’
      2) 10% shall be 15’
3. Wireless Access Point Copper Patch Cables:
   a. Patch cables shall be category 6
   b. Provide one patch cable for each port on the entire project
   c. Patch cables to be installed by wireless system installer.
   d. Patch cable lengths
      1) Interior access points: 100% shall be 10’
      2) Exterior Access Points: 100% shall be 15’
4. Video Surveillance Camera Copper Patch Cables:
   a. Patch cables shall be category 6
   b. Provide one patch cable for each port on the entire project
   c. Patch cables to be installed by the Video Surveillance System Installer.
   d. Patch cable lengths
      1) Interior Cameras: 100% shall be 10’
      2) Exterior Cameras: 100% shall be 15’
5. IP Intercom Copper Patch Cables:
   a. Patch cables shall be category 6
   b. Provide one patch cable for each IP Intercom device on the entire project, plus an additional twenty (20) for future use.
   c. Patch cables to be installed by the IP Intercom System Installer.
   d. Patch cable lengths
      1) 100% shall be 3’
6. MDF/IDF Fiber Optic Patch Cables:
   a. Patch cables shall be 12-strand single-mode.
   b. Patch cable shall be duplex, SC to SC
   c. Provide quantity sufficient for connecting all network equipment plus 20% for growth.
   d. Patch cables to be installed by network equipment installer/programmer
   e. Patch cable lengths
      1) 100% shall be 3 meters

1.5 SYSTEM SPECIFIC COLOR REQUIREMENTS

A. The following information shall apply to the complete SCS Channel. All cable, patch cables, outlet terminations, and closet terminations shall be provided in the colors designated below:

Item	Description	Horizontal Cable	Insert	Patch Cables
1	Data	Blue	Blue	Blue
2	VoIP Telephone	Blue	Blue	Blue
3	Wireless	Blue	Blue	Blue
4	Camera	Green	Green	Green

5	UP Intercom System	Blue	Blue	Blue

1.6 DOCUMENTATION

A. Labels:
The Contractor will label all outlets using permanent / legible typed or machine engraved labels approved by the Owner (no handwritten labels permitted). Label patch panels in the wiring closet to match those on the corresponding data outlets. The font shall be at least one-eighth inch (1/8") in height, block. All labels shall correspond to as-builts and to final test reports.
1. The following nomenclature shall be used when labeling data/voice jacks:
   a. All cables being served by MDF closet shall begin with '1' all IDF served cables shall begin with numerical digit 2 thru 25) designating the specific IDF's identification.
   b. Next identification letter shall refer to patch panel that is serving outlet (A, B, C…)
   c. Next identification shall note what # data port on patch panel (01 thru 48).

Example:
Label of an outlet from 23rd port of the third patch panel from top of rack located at IDF-2 shall read: 2-C-23
Label of an outlet from the 5th port of the second patch panel from the top of rack located in the MDF shall read: 1-B-05

B. Floor Plan: A floor plan clearly labeled with all outlet jack numbers shall be included in the as-built plans.

C. Cables: All cables shall be labeled at both ends. This includes but not limited to horizontal voice and data cabling, copper backbone tie cables, and fiber optic cables.

D. Fiber Optics: Fiber optic strands shall be labeled at both ends on the fiber distribution panel.

E. Equipment racks: Equipment racks shall bear at least one indicating label indicated MDF or IDF. If rack is installed in IDF, label shall include IDF #.

F. Access Points: Label ceiling grid with digital label according to location installed and a bright orange ¾" round dot sticker.

ATTACHMENT 'B'
MANUFACTURER AND MATERIAL LIST

The Communications Contractor shall perform no portion of the work requiring submittal and review of record drawings, shop drawings, product data, or samples until the respective documentation has been approved by project's Technology Consultant.

MATERIAL LIST

MANUFACTURER	DESCRIPTION	PRODUCT NUMBER	NOTES
Panduit	4-Post, Adjustable Server Rack; 84"H; 45 RMU; #12-24 Threaded Mounting Holes; Black		Provide as shown on Drawing, minimum of one (1) in the Building's MDF.
Panduit	2-Post Relay Rack; 84"H; 45 RMU; #12-24 Threaded Mounting Holes; Black		Provide as shown on Drawing, minimum of one (1) in the Building's MDF and each IDF.
Panduit	Front/Rear, 6-inch, Vertical Cable Manager		Provide one (1) between each rack and at both ends of each rack system
Panduit	Front/Rear, 19", 2RU, Horizontal Cable Manager		Provide one (1) above and below each pair of 24-port patch panels and each 48-port patch panel installed. Provide the duplicate amount for owner installation.
Hubbell	RE-BOX Commercial, Wall Mount Cabinet, 42.2" H x 24.2" W x 10" D, Black	SB8370844DFB	Provide at locations designated on the project drawings.
Panduit	EIA compliant 19" pivoting equipment rack, black in color.		Provide at locations designated on the project drawings.
Panduit	Perforated Front Door with lock		Provide one (1) for each pivoting equipment rack on the entire project.
Panduit	Fan Panel, 100 CFM, 27dB, w/ Remote Thermistor		Provide one (1) for each pivoting equipment rack on the entire project.
Panduit	8-Outlet 15A Rack mount Power/Light		Provide one (1) for each pivoting equipment rack on the entire project.
Panduit	Rackmount Power/Cooling, 11 Outlet, 20A, 2-Stage Surge		Provide one (1) for each pivoting equipment rack on the entire project.
Panduit	Grounding Busbar, 12", Kit		Provide one (1) in each MDF and IDF on the entire project
Panduit	Copper Compression Lug, 2 Hole, #6 AWG		Provide at TGBB and at each point bonding to the rack system.

MANUFACTURER	DESCRIPTION	PRODUCT NUMBER	NOTES
Panduit	Universal Cable Runway 12 in (305mm) W, Black		Provide as shown on drawings. Tray shall route to and between all racks, in each MDF/IDF, on the entire project. In addition to cable tray shown, provide vertically installed sections at each location where cables enter the room, routing down and up vertical walls and at the Service Provider's entrance location
Panduit	Cable Runway, 90° radius horizontal bend, 12-inch, black		Provide as shown on drawings.
Panduit	Cable Runway, 90° radius vertical bend, 12 inch, black, inside/outside bend		Provide as shown on drawings.
Panduit	Rack-to-Runway Mounting Kit, black in color		Provide one (1) per rack and Cabinet installed.
Panduit	Runway Stand-Off (Elevation) Kit, 4" - 6"		Provide one (1) per rack and Cabinet installed.
Panduit	Cable Runway, wall angle support kit, 12 inch, black		Provide one (1) at each location where cable tray terminates at a vertical wall
Panduit	Triangular Support Bracket. Made of 1/4" x 2" aluminum bar. Load rating is 100 lb. (45.4 kg). Black		Provide one (1), every 5', for all tray that routes horizontally along a vertical wall.
Panduit	Cable Runway, protective end cap kit (2 caps), black		Provide one (1) pair at each exposed end of all cable tray installed
Panduit	Cable Runway, junction splice kit, black		Provide one (1) set at each location where cable trays intersect.
Panduit	Cable Runway, butt splice kit, black		Provide one (1) set at each location where cable tray ends butt together
OCC	Rack mount 1RU, High Density fiber enclosure, holds 4 adapter plates	RTC1U-HD4APB	Provide as per the project drawings. Or as required, to accommodate all fiber optics in the IDFs, if not shown on drawings
OCC	Rack mount 2RU, High Density fiber enclosure, holds 8 adapter plates	RTC2U-HD8APB	Provide as per the project drawings. Or as required, to accommodate all fiber optics in the MDF/IDFs, if not shown on drawings
OCC	Rack mount 4RU, High Density fiber enclosure, holds 16 adapter plates	RTC4U-HD16APB	Provide as per the project drawings. Or as required, to accommodate all fiber optics in the MDF/IDFs, if not shown on drawings
OCC	Wall Mount 12 to 24 strand fiber optic enclosure, 13"H x 12"W x 3.5"D, black in color	WTC12/24B	Provide at wall mounted fiber optic termination locations

MANUFACTURER	DESCRIPTION	PRODUCT NUMBER	NOTES
OCC	HD Adapter Plate, 12-port, Dual SC, Single-Mode	6112DSC50QHD	Provide as required to accommodate 110% of all fiber terminated in each MDF/IDF
OCC	SM SC, pre-stubbed, factory-polished connector for use on 900m buffered fiber, Aqua Housing	RFC-SC5G	
OCC	SC-to-SC, duplex Fiber jumper, 10gb	D5GSC-SC-*F	* to be replaced with a numeric value depicting the cable length
OCC	Laser Optimized Single-Mode , Plenum, 12-Strand, Tight-Buffered, Interlocking Armored		
Panduit	Patch Panel, 24 Port, Modular Snap In, Black	CPP24FMWBLY	Provide in quantities as required to terminate 100% of all copper backbone cable. Reference project drawings.
Panduit	Patch Panel, 48 Port, Modular Snap In, Black	CPP48FMWBLY	Provide in quantities as required to terminate 100% of all distribution structured cabling, plus 25% for future growth. Reference project drawings. Voice/Data, Security, and WLAN shall have dedicated panels per system.
Dynacom	Unwired, 66-Style Termination Block with clear, hinged cover	66M1-50	Provide one (1) for each 25-pair demarcation extension cable
Dynacom	66 wiring block, metal backboard, blue in color	183C*M	* to be replaced with a numeric value depicting the board size. Provide at each demarcation point for the mounting of the 66 wiring blocks. Board size shall consist two (2) mounting brackets per 25-pair cable installed.
Panduit	Copper Cable, Enhanced Cat 6, 4-Pair, 23 AWG, UTP, CMP, 1000ft/305m	PUP6504**-UY	** to be replaced with numeric character depicting the color of the cable. Colors shall comply with designated color of the system each cable is provided for.
Panduit	Mini-Com Module, Cat 6, UTP, 8 pos 8 wire, Universal, TG Style	CJ688TG**	** to be replaced with numeric character depicting the color of the module. Colors shall comply with designated color of the system each IO is provided for.
Panduit	Mini-Com® 1-port blank module, black	CMBBL-X	provide one for each unused patch panel port
Panduit	Mini-Com® 1-port blank module, gray	CMBIG-X	provide one for each unused faceplate port

MANUFACTURER	DESCRIPTION	PRODUCT NUMBER	NOTES
Panduit	Faceplate, 2 Port, Single Gang, Classic, Stainless Steel	CFPL*SY	* to be replaced with a numeric character depicting the port quantity. Minimum port quantity shall be 4, unless being utilized for single port devices such as phones, clocks, cameras, wireless access points, etc.
Panduit	Copper Patch Cord, Cat 6, UTP Cable	UTPSP^**	^ to be replaced with a numeric value depicting the patch cable length. ** to be replaced with alpha or numeric character depicting the color of the patch cable. Colors shall comply with designated color of the system each cable is provided for. Length to comply as stated in these specifications.
Panduit	Mini-Com® surface mount box accepts two Mini-Com® Modules	CBX2WH-AY	Provide one at every above ceiling outlet location. Including, but not limited to: Ceiling Mounted Projectors, Wireless Access Points, and Video Surveillance Cameras
Leviton	QuickPort In-Ceiling Bracket	49223-CBC	Provide one at every above ceiling outlet location. Including, but not limited to: Ceiling Mounted Projectors, Wireless Access Points, and Video Surveillance Cameras
Leviton	Decora Wall plate/Faceplate	804#-*	Provide one (1) at each USB charging wall plate. '#' to be replaced with numeric characters depicting the required port count. '*' to be replaced with alphabetic characters depicting the plates cover. Port count shall be determined by the quantity of charging wall plates installed at each location. Color to white, black, or stainless steel and shall be dictated by the electrical devices within the same area

END OF SECTION

SECTION 27 41 16.20

AUDIO AND VIDEO DISTRIBUTION SYSTEMS FOR SPECIAL VENUES

PART 1 – GENERAL

1.1 RELATED WORK

A. The following sections shall associate with this specification as applicable.
1. General Conditions
2. Supplementary Conditions
3. Division 1
4. Division 26 in its entirety.
5. Division 27 in its entirety.
6. Division 28 in its entirety.

1.2 DESCRIPTION

A. Summary of Work:
1. Provide all equipment specified well as all miscellaneous parts and materials required for the proper, complete, and functional Video and/or Sound Distribution System at all spaces.
2. All applicable equipment shall bear the UL label.
3. Governing Codes and Conflicts: If the requirements of these specifications or the Project Drawings exceed those of the governing codes and regulations, then the requirements of these specifications and the Drawings shall govern. However, nothing in the Drawings or Specifications shall be construed to permit work not conforming to all governing codes, regulations, and manufacturer installation requirements.
4. Locate equipment to accommodate millwork, fixtures, marker boards and other room equipment at no additional cost to the owner.
5. Plenum rated cable may be used as an option at the contractor’s discretion. Wherever cabling is run exposed, conduit shall be used to cover and protect wiring.
6. These documents are conceptual in nature. It shall be the responsibility of the approved installer to furnish a complete and functional system, including the items shown on the drawings, in the specifications, and items not designated in either. The installer’s shop drawings and product data submittals shall represent a complete system and documents accepted do not relieve the installer from being required to provide any materials, equipment, or labor to furnish a complete and functional system as recognized by the Project’s Technology Consultant and the Owner.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
1. The contractor providing and installing the integrated audiovisual systems and associated infrastructure shall be an authorized dealer of the specified manufacturer and be capable of providing the manufacturer’s maximum available product warranty.
2. All individuals installing the audio-video system must be employees of the authorized dealer and at least 75% of the installing staff shall have undergone a training class given by the manufacturer. Current certification indicating the successful completion of the training course shall be available upon request at the project and submitted in the contractor’s product submittals.
3. The proposing contractor and the installing contractor must be the same company. No subcontractor to the proposing audio-video contractor will be allowed for any portion of the audio-video scope of work.
4. The System Installer shall meet all applicable regulations of the State and Department of Labor insofar as they apply to this type of system. The bidder shall be a firm normally employed in the audio-video industry and shall provide a reference list of ten (10) projects of equivalent size or larger and contact names confirming successful completion of projection system installations.
5. The bidder shall have an authorized service center, within 75-miles of the project’s location, for the brand of equipment that is submitted for bid. The Owner, Architect, and Consultant reserves the right to perform an onsite inspection as they deem necessary.

6. The bidder must produce a letter from the manufacturer guaranteeing the delivery of all the equipment outlined in the specification herein.

B. Pre-Construction Meeting:
1. The successful Contractor shall attend a mandatory pre-construction meeting with individuals deemed necessary by the Owner's representative prior to the start of the work.
2. The contractor shall provide a mockup of the complete integrated audiovisual system solution for each of the typical spaces below before implanting the installation in multiple like rooms. Mockup shall include all products listed in part 2 of this specification. Coordinate with G.C., Architect, Consultant, and Owner for scheduling and location of mockup.
3. All proposing contractors must have ability to demonstrate a/v system being proposed and provide owner with completely installed system to evaluate performance and operation.

C. Acceptance: The Owner's representative reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

D. Warranty:
1. The selected system installer shall be factory authorized service center and shall provide an end-to-end performance warranty of not less than one (1) year. The proposer shall provide current certification documentation. The performance warranty shall be issued by the manufacturer and shall warrant that video systems have been tested to the district's approval. This end-to-end warranty shall cover the labor associated with removing/reinstalling any associated hardware or equipment as well as the replacement of all defective equipment or hardware.
2. The bidder shall also submit with the materials mentioned in section 1.5 submittals of this specification a written explanation outlining the terms and conditions of product warranty of all parts and service of the integrated a/v solutions.

1.4 REGULATORY REQUIREMENTS

A. Standards: All work shall be performed in accordance with the latest revisions of the following standards and codes:
1. Latest Local Codes and Amendments
2. National Electrical Code, current version

B. Other References:
1. TIA/EIA-568-A Commercial Building Telecommunications Wiring Standard
2. EIA/TIA-569 Commercial Building Standard for Telecommunication Pathways and Spaces.
3. TIA/EIA-606 The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
4. TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
5. EIA/TIA 455-A Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
6. TIA/EIA TSB 67 Transmission Performance Specification for Field Testing of Unshielded Twisted-Pair Cabling Systems.
7. TIA/EIA TSB 72 Centralized Optical Fiber Cabling Guidelines
8. ISO/IEC 1180 Generic Cabling Standard
9. EN 50173 Generic Cabling Standards for Customer Premises
10. ANSI/EIA/TIA 526-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plan.

C. Governing Codes and Conflicts: If the requirements of these specifications or the Project Drawings exceed those of the governing codes and regulations, then the requirements of these specifications and the Drawings shall govern. However, nothing in the Drawings or Specifications shall be construed to permit work not conforming to all governing codes and regulations.

1.5 ABBREVIATIONS

A. The following abbreviations are used in this document:
1. AV-*# Audiovisual input station / Presentation Station (Reference drawing legend) CMP

Ceiling Mounted Projector LCD or LED Flat panel screen/monitor

1.6 SUBMITTALS

A. Project Initiation: Within fourteen (14) days of Notice to Proceed, the projection system installer shall furnish the following in a single consolidated submittal:
   1. Permits: The Contractor shall obtain all required permits and provide copies to the Owner/Architect/Engineer.
   2. Product Literature: Complete manufacturer's product literature for all, speakers, amplifiers, cable, cross-connect blocks, cable supports, cable labels, outlet devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner/Designer) and the manufacturer's supporting documentation demonstrating compatibility with other related products shall be included.
   3. Construction Schedule: A time-scaled Construction Schedule, using PERT/CPM, indicating general project deadlines and specific dates relating to the installation of the cable distribution system.
   4. Testing: Proposed Contractor test result forms, and a list of instrumentation to be used for systems testing.
   5. The contractor shall provide a letter from the manufacturer stating that the dealer is an authorized service center.
   6. The resume and contact information of the full-time service personnel responsible for the installed projection system.
   7. Specification Compliance: A letter shall be provided stating, by section and subsection, that the installer complies with the ENTIRE specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been accepted by the project's technology consultant.
   8. Certifications: The contractor shall submit all of the following certifications and the certifications must contain dates which are valid from the date of proposal and not expirer any sooner than 12 months after substantial completion of the project.
      a. Manufacturer authorized dealer certification
      b. Installer training certification
         1) Provide specification with line by line acknowledgement of compliance.

B. Shop Drawings: Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed:
   1. Proposed wiring and connectivity diagram of the proposed projection system including all faceplates and sound reinforcing equipment
   2. In addition to the wiring/connectivity diagram, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:
      a. Location of wall penetrations (all penetrations shall be sleeved and contain protective bushings at both ends)
      b. Location of sleeved wall pass-thru
      c. Size of sleeve at each location installed
      d. Quantity of cable passing through each sleeve
      e. Location of drops in each room (quantity or labeling of drops are not required in the submittal plans. Labeling shall be provided in the closeout plans and quantities shall be as per the contract documents, addendums, and issued changes. Each drop shall be labeled for the type of outlet that it is)
      f. Conduit routing, size, quantity, and stub-up locations for all floor mounted outlets.
   3. Drawing Compliance: A letter shall be provided stating that the installer complies with the ENTIRE project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. NO DEVIATIONS SHALL BE ACCEPTABLE UNTIL THEY HAVE BEEN ACCEPTED BY THE PROJECT'S TECHNOLOGY CONSULTANT.

C. Project Completion: As a condition for project acceptance, the Contractor shall submit the following

for review and approval:

1. Samples: Complete manufacturer's product literature and samples (if requested) for all pre-approved substitutions to the recommended products made during the course of the Project.
2. Inspection and Test Reports: During the course of the project, the Contractor shall maintain an adequate inspection system to ensure that the materials supplied, and the work performed conform to Contract requirements. The contractor shall provide written documentation that indicates that materials acceptance testing was conducted as specified. The Contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.
3. Operating and Maintenance Instructions: Operating and maintenance instructions for all devices within the system. These instructions shall reflect any changes made during the course of construction and shall be provided to the Owner for their use on disc or USB drive with the project name and description (2 copies).
4. Provide schematic line diagram of system components as deployed in each installation.

PART 2 – PRODUCTS

2.1 GENERAL

All products listed in this section shall be provided and installed by the contractor unless otherwise noted below. The following list is not intended to be a complete list of required equipment or cables as the project is to be Turnkey and may require equipment beyond the depth of this list. It is the contractor's responsibility to ensure that they are providing a complete and functional system with their proposal. All part numbers listed herein are for performance basis of design reference only. Prior to purchasing and installing equipment, the contractor shall ensure that the most up-to-date equivalent products from the same manufacturer are provided.

A. Installation: The cabling shall be installed per requirements of the manufacturer and the Project Documents utilizing materials meeting all applicable TIA/EIA standards. The Contractor is responsible for providing all incidental and/or miscellaneous hardware not explicitly specified below as required for a complete and operational system.

B. Materials: Materials shall be as listed or shall be approved equivalent products of other manufacturers meeting the intent and quality level of the TIA/EIA specifications. All approved equivalent products will be published by addendum ten days prior to proposal for Architect / Engineer to review.

C. Testing: All installed cabling shall be tested 100% good after installation by the Contractor.

D. Ratings: All products shall be new and brought to the job site in the original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's Laboratories label. All communications cable shall bear flammability testing ratings as follows:

CM Communications Cable
CMP Plenum Rated Communications Cable
CMR Riser-Rated Communications Cable

E. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of the proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket that would indicate possible problems. Damaged cable or any other components failing to meet specifications shall not be used in the installation.

F. Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit.

1. Approved Products
   a. Twisted-pair cable: Dyna-Blue
      American Polywater

G. Fire Wall Sealant: Any penetration through firewalls (including those in sleeves) will be resealed with an Underwriter Laboratories (UL) approved sealant.

1. Approved Products
   a. 3M or
   b. Pre-approved equal

2.2 WEIGHT ROOM C148 – AUDIO AND VIDEO DISTRIBUTION

A. Contractor to provide and install a complete video and audio distribution system in compliance with the equipment specified in the table below and associated drawings. Installation shall be turnkey, including programming, testing, and training.

QTY	MFR	PRODUCT NUMBER	DESCRIPTION
AUDIO DISTRIBUTION			
1	Q-SYS	Core 8 Flex	Digital Signal Processor
1	Q-SYS	CX-Q 2K4	1000W 4-Channel Network Amplifier
1	Bluesound	B400S	4-zone network music player - Shared with indoor practice facility.
Ref. Plans	Q-SYS	AD-S8T	8-inch 2-way, 75° conical Speaker – Provide Yoke mounts as required.
1	RDL	D-BTN21	Bluetooth Audio Dante/AES67 Network Interface (White)
VIDEO DISTRIBUTION			
1	Q-SYS	TSC-70-G3	7” Touch Screen AV Controller to control source.
1	FSR	WB-TSC-FM-10	Touchscreen Wall Plate Cover
WIRELESS MICROPHONE SYSTEM			
1	Shure	QLXD124/85	Combo Wireless Handheld and Lavalier Microphone System – provide (2) additional over the ear mics.
1	Shure	SBC200	Dual Docking Charging Station
2	Shure	SB900B	Rechargeable Lithium-Ion Battery
1	RF Venue	D-ARC	Diversity Architectural Antenna – Coordinate color with architect
2	Shure	UABIAST	In-Line Power Adapter
AV NETWORK EQUIPMENT			
1	Netgear	M4250-40G8XF-PoE+ (GSM4248PX)	AV Line 40x1G PoE+ 960W and 8xSFP+ Managed Switch – Shared with Indoor Practice Facility

2.3 INDOOR PRACTICE FACILITY – AUDIO AND VIDEO DISTRIBUTION

A. Contractor to provide and install a complete video and audio distribution system in compliance with the equipment specified in the table below and associated drawings. Installation shall be turnkey, including programming, testing, and training.

QTY	MFR	PRODUCT NUMBER	DESCRIPTION
AUDIO DISTRIBUTION			
1	Q-SYS	Core 24F	Digital Signal Processor - Shared with indoor Practice facility – Connect displays audio output to DSP input
2	Q-SYS	CX-Q 4K8	1250W – 4 Channel Network Amplifier
Ref. Plans	Q-SYS	AD-S12	12-inch 2-way, 75° conical Speaker - Black in color - Provide Yoke mounts as required.
2	RDL	D-BTN21	Bluetooth Audio Dante/AES67 Network Interface (White)
VIDEO DISTRIBUTION			
2	Q-SYS	TSC-10-G3	10” Touch Screen AV Controller
2	FSR	WB-TSC-FM-10	Touchscreen Wall Plate Cover
WIRELESS MICROPHONE SYSTEM			
1	Shure	QLXD124/85	Combo Wireless Handheld and Lavalier Microphone System – provide (1) additional over the ear mics.

1	Shure	SBC200	Dual Docking Charging Station
2	Shure	SB900B	Rechargeable Lithium-Ion Battery
1	RF Venue	D-ARC	Diversity Architectural Antenna – Coordinate color with architect
2	Shure	UABIAST	In-Line Power Adapter

2.4 PLAYER MEETING ROOMS – AUDIO AND VIDEO DISTRIBUTION

A. Contractor provide and install a complete video and audio distribution system in compliance with the equipment specified in the table below and associated drawings. Installation shall be turnkey, including programming, testing, and training.

QTY	MFR	PRODUCT NUMBER	DESCRIPTION
AUDIO DISTRIBUTION			
1	Q-SYS	Core 8 Flex	Digital Signal Processor - Connect displays audio output to DSP input
1	Q-SYS	MP-A40V	200W, 4-Channel Network Amplifier
Ref. Plans	Q-SYS	AD-C6T-ZB	6-inch 2-way, 75° conical Speaker
VIDEO DISTRIBUTION			
4	Q-SYS	TSC-70-G3	7” Touch Screen AV Controller for input control
4	Visionary Solutions	D5200	AVoIP Decoder – connect touch USB port on interactive display to decoder.
4	Visionary Solutions	E5-WP	AVoIP Wall plate encoder
4	Visionary Solutions	E5200	AVoIP encoder – connect to display HDMI output to mirror interactive display
3	Lutron	GRX-IRPS-WH	Partition Sensor. Coordinate power and conduit requirements with Division 26.
AV NETWORK EQUIPMENT			
1	Netgear	M4250-26G4F-PoE+ (GSM4230P)	24x1G PoE+ 300W 2x1G and 4xSFP Managed Switch

2.5 ENTRANCE HALL C147 – AUDIO AND VIDEO DISTRIBUTION

A. Contractor provide and install a complete video and audio distribution system in compliance with the equipment specified in the table below and associated drawings. Installation shall be turnkey, including programming, testing, and training.

QTY	MFR	PRODUCT NUMBER	DESCRIPTION
AUDIO DISTRIBUTION			
1	Extron	NetPA U 2002 SB	400W Two Channel Bridgeable Output Amplifier with Dante and DSP - Connect displays audio output to amplifier audio input.
Ref. Plans	JBL	SLP14/T	Low-Profile On-Wall Loudspeaker – Black in color

2.6 HEAD COACH C106 – AUDIO AND VIDEO DISTRIBUTION

A. Contractor provide and install a complete video and audio distribution system in compliance with the equipment specified in the table below and associated drawings. Installation shall be turnkey, including programming, testing, and training.

QTY	MFR	PRODUCT NUMBER	DESCRIPTION
VIDEO DISTRIBUTION			

1	Liberty AV	DL-1H1A1UC-WPKT	HDMI & USB-C HDBaseT Wall Plate Extension Set w/USB

2.7 AUDIO AND VIDEO COMPONENTS AND EQUIPMENT - ALL VENUES

A. Custom Plates
1. Liberty Panel Crafters, Proco, or RCI are approved manufacturers.
2. Provide custom plates as indicated on the drawings.

B. Equipment Rack: Provide and install equipment rack at locations designated on the contract drawings. Equipment rack shall consist of the following:
1. Enclosure:
a. Atlas Sound 300 Series wall mount rack with 6 spare keys. (1 per venue). Provide size to accommodate all equipment, plus an additional 25% for future growth.
2. Additional Accessories:
a. Middle Atlantic D3 (3) space rack drawer (1 per venue)
b. Juice Goose JG 8LED Power Distribution Center with LED Lighting (1 per venue)
c. Juice Goose CQ 1520 Sequenced Power Control System (1 per venue)
d. Provide any additional hardware or lacing strips to make a complete installation
e. Provide blank panels necessary to enclose rack completely.

C. Miscellaneous Equipment
1. Provide the following equipment for each venue, unless noted otherwise. (excluding the Advanced Culinary Lab, Weight Room, and Wrestling Room)
a. (2) Shure SM58S-LC Microphones, per venue
b. (1) 25’ Microphone cable, per venue
c. (1) 50’ Microphone cable, per venue
d. (2) Atlas MS20E Mic Stand, per venue
e. (1) Atlas TL34-15E Boom Stand, per venue

D. Assistive Listening
1. Provide a remote antenna. Adjust DSP for “hard knee” compression on assisted listening output. Test and use equalization for maximum sound quality.
a. Listen LT-800-072-01 – Assisted Listening RF Transmitter
b. Listen LA-326 Universal Rack Mounting Kit
c. Listen LR-500-072-P1 Advanced Intelligent DSP RF Receiver
d. Listen LA-430 Intelligent Ear Phone/Neck Loop Lanyard
e. Listen LA-380-01 Intelligent 12-Unit Charging/Carrying Case
f. Provide quantities needed to fulfill the quantities stipulated in the Receivers for Assistive Listening Systems Table.

RECEIVERS FOR ASSISTIVE LISTENING SYSTEMS TABLE

Capacity of Seating in Assembly Area	Minimum Number of Required Receivers	Minimum Number of Required Receivers Required to be Hearing-aid Compatible
50 or less	2	2
51 to 200	2, plus 1 per 25 seats over 50 seats	2
201 to 500	2, plus 1 per 25 seats over 50 seats	1 per 4 receivers
501 to 1000	20, plus 1 per 33 seats over 500 seats	1 per 4 receivers
1001 to 2000	35, plus 1 per 50 seats over 1000 seats	1 per 4 receivers
2001 and over	55, plus 1 per 100 seats over 2000 seats	1 per 4 receivers

E. Programming shall be coordinated with the Owner and Project’s Consultant. Programming shall include, but not be limited to the following:
1. AV Control Panel Configuration
2. Audio routing from any source location through the DSP
3. Screen control via the Audio / Video Control panel
4. Device resolution and over/under-scanning settings
5. Incorporation of any Owner furnished source equipment (maximum of 2)

2.8 DISPLAYS AND MOUNTING HARDWARE

A. All displays and digital signage players shall be owner furnished, contractor installed.

B. Wall Mounted Monitors: Provide the following at each wall mounted flat screen display location on the entire project
1. Universal Flat Wall Mount: Peerless Product No.SF680
2. Articulating Wall Mount for 39" to 90" Displays installed on prefabricated walls: Peerless Product No. PA762. Coordinate with architect.
2. Provide Triple Stud Wall Plate for each, stud-wall, wall mounted solution as needed.

2.9 AUDIO AND VIDEO CABLING AND COMPONENTS

A. Cabling:
a. One (1) HDMI Cable, from AV input plate to the AV device location.
1) For runs 40’ or less, provide Liberty Product No. P-HDM-M-* HDMI active cable.
2) For runs over 40’, Provide (1) Liberty AV Product no DL-1H1A1UC-WPKT, HDMI & USB-C HDBaseT Wall Plate Extension Set w/USB at Wall plate AV input locations.
3) For runs over 40’, Provide (1) Liberty AV Product no. DL-1H1A1UB-H3, 4K HDMI & USB HDBaseT 3.0 Extension Set at floor box AV input locations.
b. One (1) 3.5mm Stereo Audio Cable, Liberty Product No. P221P-3.5TRSM-M-* (cable shall provide connection from the device audio output to the audio amplifier or DSP)
C. The (*), at the end of each product number above, shall be replaced with a numerical value depicting the length as required per location.

B. Components:
a. Provide the following at each AV Input Wall Plate (AV-1, PS, AVI, etc.:)
1) One (1) HDMI Pass-Thru, with Pigtails, C2G Product No. 39710
2) One (1) 1-Gang Decora Wallplate, Standard Size.
b. Provide the following at each AV Output Wall Plate associated with a video display (FSD, Monitor, or Digital Signage) unless noted otherwise elsewhere.
1) One (1) HDMI + 3.5MM Stereo Audio Pass-Thru, with Pigtails, C2G Product No. 39872
2) One (1) 1-Gang Decora Wallplate, Standard Size.
c. The (*), at the end of each product number above, shall be replaced with a numerical value depicting the finish and color. Contractor to match finish and color.
d. Provide lockable covers for physical audio inputs at practice facility.

2.10 AUDIO VISUAL PATCH CABLES

A. Provide and install the following Patch Cables
1. Provide the following at each AV Input Outlet:
a. One (1) 10’ HDMI Patch Cable, C2G Product No. 56784
2. Provide the following at each AV Output Outlet:
a. One (1) 6’ HDMI Patch Cable, C2G Product No. 56783

2.11 CABLE ROUTING/PATHWAY

A. Cable Support System: All audio-video cabling shall be installed and supported using an approved J-Hook cable support system at 4’-0” intervals unless installed in conduit. Do not exceed manufacture recommendation for the quantity of cables supported in an individual support.

B. All cable bundles shall be grouped together using plenum rated Velcro for the entire run above and below the ceilings.

PART 3 – EXECUTION

3.1 GENERAL

A. Contractor is required to properly mount integrated A/V solutions and connect all video / audio cables to component inputs.

B. Contractor is required to thoroughly test and verify operation of all A/V inputs and video modes prior to project completion.

C. Contractor shall provide owner with written verification test process and results once all projectors have been installed, tested, and placed in final condition.

D. Damage: The Contractor shall replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over tightened bindings, loosely twisted and over-twisted pairs at terminals and cable sheath removed too far (over 1-1/2 inches).

E. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.

F. Clean Up: All clean up activity related to work performed will be the responsibility of the Contractor and must be completed daily before leaving the facility.

G. Provide audio ducking signal from PA system to all local sound systems systems.

3.2 DOCUMENTATION

A. Contractor shall provide owner with detailed serial number listing and associated graphical room number designation equipment was installed. Contractor shall use actual graphical package room numbers not architectural plan numbers from construction set.

3.3 STATION WIRING INSTALLATION

A. General: All cable must be handled with care during installation so as not to change performance specifications. Factory twists of each individual pair must be maintained up to the connection points at both ends of all category 6 cable. There shall never be more than one and one-quarter inch of unsheathed enhanced Category6 UTP cable at either the wiring USB Transmitter or Receiver.

B. Exposed Cable: All cabling shall be installed inside walls or ceiling spaces whenever possible. Exposed station cable will only be run where indicated on the Drawings. Additional exposed cable runs will require Owner approval and will only be allowed when no other options exist.

C. Placement: All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair the Owner’s efficient use of their full capacity.

D. Cable Routes:
1. All cabling placed in ceiling areas must be in conduit, cable tray or an approved J-Hook cable support. Cable supports shall be permanently anchored to building structure or substrates. Provide attachment hardware and anchors designed for the structure to which attached and that are suitably sized to carry the weight of the cables to be supported. Do not route cable through webbing of structural steel. Cabling must be supported in dedicated supports intended to support cabling as described in this section. Contractor shall adhere to the manufacturer’s suggested fill ratio for each size cable support installed.
2. Attaching cable to pipes or other mechanical items is not permitted. Communications cable shall be rerouted so as to provide a minimum of 18 inches spacing from light fixtures, sources of heat, power feeder conduits and EMI sources. Cabling shall not be attached to ceiling. Grid support wires. Cable runs shall be routed down the corridors; parallel or perpendicular to building structure. Multiple cables to be bundled together at and between each cable support installed.
3. Contractor shall be responsible for coordinating with other trades on the project so that the installed cable pathway does not interfere with the installation of other systems to insure that mechanical ducts, pipes, conduits, or any other above ceiling systems are not putting unnecessary stress on any portion of the install audio-video cabling.

3.4 STATION HARDWARE

A. Flush mounted components: all component shall be inserted to a flush mounted faceplate unless designated otherwise.

B. Placement: Where possible, the AV input outlets shall be located so that its centerline is 18 inches above floor level or 12 inches above permanent bench surfaces. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches.

3.5 PROGRAMMING

A. Programming shall be coordinated with the Owner and Project's Consultant. Programming shall include, but not be limited to the following:
   1. AV Control Panel Configuration
   2. Audio routing from any source location through the DSP
   3. Screen control via the Audio / Video Control panel
   4. Device resolution and over/under-scanning settings
   5. Incorporation of any Owner furnished source equipment (maximum of 3)

3.6 FINAL TESTING REQUIREMENTS

A. Notification: The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.

B. Inspection: Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms and timetable for all copper and fiber optic cabling.

C. Procedures: Trained personnel shall perform all testing. Acceptance of the test procedures discussed below is predicated on the Contractor's use of the recommended products and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors. Testing procedures shall consist of, but not me limited to the following:
   1. Input locations to be tested utilizing multiple types of source equipment. Equipment to include:
      a. Personal Computer (laptop)
      b. Apple iMac
      c. Apple Mac Mini
      d. Google Chromebook
      e. Additional devices may be required at the time of testing
      f. contractor to provide devices on a single cart, to roll between inputs during testing.
   2. Routing of video, from any source to each display simultaneously and independently.
   3. Routing of audio, from any source to each audio channel simultaneously and independently.
   4. Control of the entire system from each installed A/V Control Panel
   5. Additional test requirements may be required at the Owner and/or Consultant's request.

3.7 OWNER TRAINING AND DEMO

A. A/V integrator shall provide demonstration of all integrated a/v solutions to owner's staff that have any stake with the operation and maintenance of the a/v solutions. Integrator shall produce sign in sheets for record of who was trained and when. Copies of sign in sheets shall be submitted with close out paperwork. Coordinate training dates with owner at project completion.

B. Integrator shall provide factory training for owner's operations and maintenance personnel for each major component of the systems listed in the A/V solutions outlined in part 2 of these specifications. Training shall be a minimum of 4 hrs. per person. Re-training of staff shall be available, at no cost to the owner, to a maximum of 3 on-site training sessions up to 1 year from the date of project competition.

C. All training is to be recorded via video recording and a copy of the recorded video shall be provided to the owner upon completion. All video recording equipment, for the recording of training, shall be provided by the integrator.

END OF SECTION

SECTION 27 50 00

SCHOOL COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED WORK

The following, in their entirety and as applicable, shall apply to this section. Including any associated drawings.

A. Conditions of the Contract
B. Division 1
C. Division 26
D. Division 27
E. Division 28

1.2 SUMMARY

A. This section includes a fully operational IP platform for a district-wide internal and school Critical Communications Solution, incorporating school safety notifications and general communications including but not limited to the following:
   1. The platform shall provide complete internal communications and employ state of the art IP Technology including the minimum functions listed.
      a. Two-way internal intercommunications between staff locations and classrooms.
      b. Scheduled bell events.
      c. Emergency announcements that will override any pre-programmed audio, assuring that all Emergency/Lockdown etc., are heard at each and every speaker location.
      d. Capability of prerecording emergency announcements that can be activated by a Soft Key on an administrative console, panic button, dial string, or web browser.
      e. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.
      f. District-wide, Emergency, Group, All School and Zone live voice paging.
      g. District-wide, Emergency, Group, All School and Zone paging for pre-recorded audio – tones, music and voice.
      h. Web-based user interface.
   2. The system shall support a minimum of 1000 level priorities which shall be user-definable, allowing each end point to place a minimum of 5 different priority calls at the same time.
   3. Any authorized administrator shall be able to call from outside the school into any classroom, zone, or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation, and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools).
   4. Authorized system users shall be able to create a minimum of 100 automated sequences with voice instructions, tones, emails, program distribution, and relay activations and replay them.
   5. Automated message strings shall be manually initiated from a single-button access on the console, on a SIP connected telephone, a panic button, from the web-based user interface or via interface with third party systems.
   6. Paging and two-way intercom features shall be accessible from any system console or SIP connected telephone for each campus.
   7. The platform shall synchronize its system time to the network timeserver or a web-based time server.
   8. Each single campus installation shall be locally survivable for intercom, paging, bells, and emergencies such as lockdown, even when the district connection is unavailable.
   9. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system.
   10. Systems that do not comply with the feature-sets highlighted in this Specification will not be considered.

B. Locate equipment to accommodate millwork, fixtures, marker boards and other room equipment at no additional cost to the Owner.

C. Integrate the communications system with the following systems:
   1. Clock and Bell System
   2. Local sound reinforcement sound systems

D. Return air plenum cable shall be used. Wherever cabling is run exposed, conduit shall be used to cover and protect wiring.

E. The drawings and specifications are to be considered conceptual in nature and are intended to establish system standards insofar as manufacturer type and system configuration. The contractor shall provide pricing of a complete engineered system based on the issued conceptual documentation. The engineered system is to be submitted to the project's consultant for review prior to installation.

F. Scope of work is to expand existing system.

1.3 DEFINITION OF TERMS

A. Installer(s): Shall refer to the person, persons, or company who or which actually contracts to perform the work specified herein.

1.4 SUBMITTALS

A. Product data for each component.

B. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, location of each field connection, and a complete schedule of all equipment and materials with associated manufacturer's cuts sheets which are to be used.
   1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.
   2. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.
   3. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor's name in the title block.
   4. Details and descriptions of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.

C. FCC Approval: The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems, which are not FCC approved or utilize an intermediary device for connection, will not be considered. Provide the FCC registration number of the system being proposed as part of the submittal process.

D. Product Certificates: Signed by manufacturers certifying that products furnished comply with specified requirements.

E. Installer Certificates: Signed by manufacturers certifying that Installers comply with specified requirements.

F. Manufacturer Certificates: Signed by manufacturers certifying that they comply with specified requirements.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

H. Maintenance Data: For equipment to be included in maintenance manuals specified in Division 1.
   1. Record of Owners equipment-programming option decisions.

2. All instructions necessary for proper operation and manufacturer's instructions.
3. "Proof of Performance" information.
4. Manufacturer's maintenance information.
5. Copies of non-proprietary computer programs and system set up disks documenting all programmable features of the installed system.

I. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during "Final Acceptance Testing".

J. System Training: Submit the following information describing the training programs and system trainers as outlined in paragraph 1.6 of this specification and in accordance with Division 1 specifications.
1. Include with the submittal a preliminary staff development training program in outline form for review and approval by the owner's representative.
2. Include with the submittal a current copy of the trainer's certification from the manufacturer that certifies and identifies the trainer(s) who are eligible to provide training and support for the project.
3. Include with the submittal a current copy of trainer's needs assessment form which will be reviewed with the owner's designated representative for the system's preliminary system programming and configuration.
4. Include with the submittal copies of all documentation used to identify for the owner those participants attending and completing the training programs.

K. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required **five-year** warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section. Provide the following within thirty (30) days after notification to proceed:
1. Provide a list of installations that the Installer has specifically installed for verification by the Owner. Random installations from other vendors and/or Installers shall not be accepted. The Installer, not its employees, must meet these qualifications.
2. The Installer shall be bondable.
3. The Installer shall demonstrate to the satisfaction of the Owner or his representative that he has:
   a. Adequate plant and equipment to pursue the work properly and expeditiously.
   b. Adequate staff and technical experience to implement the work.
   c. Suitable financial status to meet the obligations of the work.
   d. Technically capable and factory trained service personnel at a local service facility to provide routine and emergency service for all products used in this project.

B. Any Contractor, who intends to bid on this work and does not meet the requirements of the "Quality Assurance" paragraph(s), shall employ the services of an "Installer" who does meet the requirements and who shall provide the equipment, make all connections and continuously supervise the installation. A subcontractor so employed as the "Installer" must be acceptable to the Architect/Engineer. The "Installer" shall be identified within thirty (30) days of notification to proceed for acceptance by the Architect/Engineer.

C. Because the life expectancy of this type of communications structure normally exceeds 10 years, the owner expects continuity from the service provider. If the installing/servicing company has not been an authorized provider of the manufacturer's product for it least seven (7) years, the following is required:
1. A list of two (2) systems manufacturers of which they currently are authorized service providers where the relationship exceeds seven (7) years.
2. A letter from the manufacturer outlining the details of changes in service providers over the

last seven (7) years and what actions they will take to ensure continuity of service to the customer.

D. Each major component of equipment shall have the manufacturers name, address and model number on a plate securely affixed in a conspicuous place. NEMA code ratings, UL Label, or other data that is die-stamped into the surface of the equipment shall be easily visible.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

F. Comply with NFPA 70

G. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.

H. Comply with UL 60950.

1.6 SUBMITTALS

A. Project Initiation:
1. Within fourteen (14) days of Notice to Proceed, the projection system installer shall furnish the following in a single consolidated submittal:
a. Product Literature: Complete manufacturer's product literature for all, speakers, amplifiers, cable, cross-connect blocks, cable supports, cable labels, outlet devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner/Designer) and the manufacturer's supporting documentation demonstrating compatibility with other related products shall be included.
b. Construction Schedule: A time-scaled Construction Schedule indicating general project deadlines and specific dates relating to the installation of the cable distribution system.
c. The contractor shall provide a letter from the manufacturer stating that the dealer is an authorized service center.
d. The resume and contact information of the full-time service personnel responsible for the installed projection system.
e. Specification Compliance: A letter shall be provided stating, by section and subsection, that the installer complies with the entire specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been accepted by the project's technology consultant.
f. Certifications: The contractor shall submit all of the following certifications and the certifications must contain dates which are valid from the date of proposal and not expirer any sooner than 12 months after substantial completion of the project.
i. State Licenses as applicable to this system
ii. Manufacturer's Authorized Dealer Certification
iii. Manufacture Installer Training Certificate (required for at least 25% of all installers on site.)
i. Provide specification with line by line acknowledgement of compliance.

B. Shop Drawings:
1. Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed:
a. Proposed wiring and connectivity diagram of the proposed projection system including all faceplates and sound reinforcing equipment
b. In addition to the wiring/connectivity diagram, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:
1) Location of wall penetrations (all penetrations shall be sleeved and contain protective bushings at both ends)
2) Location of sleeved wall pass-thru
3) Size of sleeve at each location installed

4) Quantity of cable passing through each sleeve
5) Location of drops in each room (quantity or labeling of drops are not required in the submittal plans. Labeling shall be provided in the closeout plans and quantities shall be as per the contract documents, addendums, and issued changes. Each drop shall be labeled for the type of outlet that it is)
6) Conduit routing, size, quantity, and stub-up locations for all floor mounted outlets.

c. Drawing Compliance: A letter shall be provided stating that the installer complies with the ENTIRE project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter.
No deviations shall be acceptable until they have been accepted by the project's technology
Consultant.

1.7 IN-SERVICE TRAINING

A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members, and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.

B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.

C. All staff development training is to be coordinated through the owner's designated representative. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff a document listing all of the staff and faculty members who attended, received, and completed the training program.

1.8 WARRANTY

A. Provide a manufacturer's five-year warranty of the school communications network equipment against defects in material and workmanship. This warranty will cover all electronic system components. Additional warranties cover clocks, speakers, and call in switches. If any defects are found within the warranty period, the defective equipment shall be replaced at no cost (equipment only); a one-year warranty shall be provided for labor.

B. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary. The standard five-year warranty is an important element in establishing a standard in quality. Manufacturers who circumvent the five-year warranty by offering special "extended warranties" that are not part of their normal published warranty will not be accepted.

C. Contractor shall respond, excluding weekends and holidays, within 24 hours to any warranty service calls. If equipment cannot be repaired within 24 hours of service visit, the contractor shall provide "loaner" equipment to the facility at no charge.

D. Make available a service contract offering continuing factory authorized service of the system after the initial warranty period.

1.9 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide the following system:
1. Telecenter U as manufactured by Rauland and installed by a Rauland authorized dealer

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. The New Campus Communications System will connect to the Existing District Server for District Wide announcements and all Management Functions. Server Currently Runs the Rauland Telecenter Campus Enterprise Software.

B. The platform shall utilize state of the art IP Technology for Call-in Notification, School Safety Paging and Evacuation tones, Atomic Time Synchronization, Class Change Tones utilizing multiple, programmable schedules for each zone, Two-way hands-free Internal Communications and Paging, and Program Distribution. The system shall be easy to learn and operate. All standard programming shall be web-based and user friendly to allow the system administrator the ability to easily program system features.

C. Provide complete and satisfactorily operating district/school communications and district/school safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

D. The platform shall be a single electronic system consisting of a minimum of 10 audio channels for each campus, (classroom) IP Speaker Modules and call switches, IP Zone Modules connecting corridor speakers, inside and outside horns, IP Administrative Consoles, SIP enabled PBX integration and district-wide integration for paging, emergency notifications, calendar scheduling and configuration.

E. Each Classroom shall be provided with a Speaker Module interface and a minimum of 5 different call switches, each with their own annunciation path and priority.

F. Call-ins may automatically annunciate (display of priority and location) to administrative consoles, SIP enabled phones, and outside phones.

G. Call-ins shall be programmed to automatically change priority and annunciation route based on age of call-in and original priority.

H. Call-ins may have priority (and annunciation route) changed by user action from a console or SIP enabled phone.

I. Call-in annunciation route shall include playing pre-recorded audio over speakers, sending a pre-configured email, and activating relays.

J. The platform shall lend itself to expansion by simple addition of hardware modules.

K. The platform shall connect directly to an existing, standard protocol WAN/LAN network, without the need for a separate server at each school location. Configuration, including bell schedules, calendars, and emergency sequences can be remotely created, changed, stored and downloaded to the system by an authorized user from a web-based user interface.

L. The platform shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone or connected web browser within the facility or outside the facility to any other location within the facility or district.

M. The platform shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands-free and will not require any interaction by the classroom user.

N. The platform shall provide classroom users the ability to confirm that they have safely secured their classrooms during an emergency with a single button press. The front office administrator will receive confirmation that the classroom is safely secured via an administrative console and web-based user interface. The front office administrator can view classrooms that are not safely secured via the administrative console. The front office administrator can view classrooms that are not safely secured

via the web-based user interface. The front office administrator shall be able to initiate two-way communication, without a pre-announcement tone, to the classroom during an emergency via the administrative console. Web-based user interface will still identify that a school is in an emergency, even if all classrooms are safely secured. Individual classroom check-in and school emergency status shall be viewed from the web-based user interface, both on-site and remotely.

O. IP Addressable and POE powered Speaker Modules for individual rooms shall be system programmable and may be assigned any two, three, four, five- or six-digit number as well as name and description. Any extension may be reassigned at any time.

P. IP-enabled two-way voice communication shall be available from any provided telephone or administrative console through any speaker in a campus. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is active, complying fully with all privacy legislation. Preannounce tone and supervisory tones shall be disabled during designated emergencies automatically.

Q. The platform shall allow users to configure multiple schedules per school, with a minimum of 500 unique events per schedule, and automatic Daylight Savings time correction. Schedules can be programmed to occur once, daily, weekly, monthly, or in any combination of the preceding recurrences. Each school may have a minimum of 20 unique bell schedules, with a minimum of 5 active schedules on any given day for each campus. User shall be able to select from 25 standard included tones as well additional user created and uploaded audio files for class change signaling and messaging. In addition, scheduled events shall include relay actions, email notifications, and paging exclusions as system configuration changes. The platform shall allow control of the bell schedules via the district WAN/LAN without the need for a separate server at each school location. Bell schedules can be remotely created, changed, stored and assigned to calendar days for the local school by an authorized user from a web-based user interface.

R. The platform shall be able to integrate with an existing PA system or operate as a fully independent IP solution. The platform shall be able to function in combination of said configurations and allow for seamless communication within a school or district-wide, regardless of the type of configuration used. The platform shall be scalable, with the ability to easily add, install, and configure additional equipment to a system.

S. The platform allows for customization of preprogrammed sequences, used for emergencies, events, and everyday communications. Preprogrammed sequences can be activated from the push of a relay button, soft key of an administrative console, a dial string of a SIP phone, or a web browser configured to the district network. Sequences can be initiated automatically as part of a schedule or on the fly. Preprogrammed sequences can be customized to utilize any combination of audio tones, emails, relays, tone exclusions, swings, delays, duples, SIP phone notifications, and program distribution. Audio tones can include customized audio files and voice messages, recorded in any language. Uploaded audio tones and messages can be preprogrammed to annunciate repeatedly or individually, as part of a scheduled sequence or on the fly. Each school in a district can have its own customized sequences, and can be activated individually, in groups, or district-wide.

2.2 EQUIPMENT AND MATERIAL

A. Server Software
1. Provides district-wide paging, bell event scheduling, emergency notification and configuration for entire district.
2. Ability to configure system and initiate system features, per school and district-wide via web-based user interface.
3. The software has the ability to sync system time to the Atomic Clock Signal or to the school’s or district’s network time server.
4. The software will provide a web browser to deliver district-wide emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The software must be capable of automatically notifying district personnel via the WAN/LAN of an alarm condition.
5. The software can automatically broadcast emergency instructions via associated system

hardware throughout an entire district when an alarm (e.g. lockdown, lockout, security, fire) is initiated via the web-based user interface. The emergency instructions are preprogrammed and require no user intervention. Bell tones are able to be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.

6. The software allows for user-uploaded pre-recorded messages and tones. Software supports the upload of MP3 and WAV file types. User-uploaded pre-recorded messages and tones can be part of emergencies, sequences, and bell schedules.
7. The software can be installed in cloud, virtual or physical server environments.
8. The web-based user interface supports secure HTTP browsing.
9. The software supports encryption to ensure secure access.
10. The system shall monitor itself if devices go offline and system actions are not received. Specified users shall receive email notifications when devices go offline. The software shall be able to keep a log and report on system activity within a school or all schools district-wide for a minimum of one year. These reports can be exported to excel spreadsheets.
11. The software will support a minimum of 20 bell schedules per school, with 5 schedules assignable to a specific school day. Bell schedules can be programmed to annunciate tones, activate relays, send emails, activate program distribution, and notify SIP phones.
12. The system allows programmable end points to be automatically included or excluded for live paging, bell tones, or prerecorded audio, depending on the time or day or day of the week. These inclusions/exclusions can be applied manually or automatically depending on their schedule.
13. The software can automatically send an email, as part of a programmed sequence of events, to district administrators alerting them of an emergency within the district.
14. The software provides the ability to view schools that are in an emergency status, using any web browser on the district's network. The software shall identify the name of the school in an emergency as well the type of emergency that school is in.
15. The software provides the ability to view individual classrooms that are not checked-in during an emergency, using any web browser on the district's network. The software shall identify the name, extension, and description of the classroom that is not checked-in during the emergency.
16. The system has a minimum of 5 customizable emergencies, one of them being an All-Clear – with the ability to return the system from an emergency to normal status. Each emergency shall have a minimum of 500 unique events.
17. As a district-wide communications solution, the system shall be able to provide simultaneous communications to all schools or groups of schools within a district. The system shall allow a user to initiate district-wide communications to individual schools, all schools or groups of schools, from a web-based user interface. The system shall allow a user to initiate prerecorded audio, live paging, or programmed sequences to individual schools, all schools or groups of schools, from the web-based user interface. Programmed sequences shall be customizable per school, and the system shall be able to activate them simultaneously to individual schools, all schools or groups of schools, from the web-based user interface.
18. The communications software must allow upgrade from an individual school system to multiple schools, or an entire school district, using the same web-based user interface. The communications software from an individual school system must be identical in typical user operation to the multiple schools or entire school district communications system software.

B. Campus Controller

1. Provides call routing for paging and intercom for a single facility.
2. System shall connect to the district provided Telephone Network via a SIP connection.
3. Support a flexible numbering plan allowing two, three, four, five, or six-digit extensions.
4. SIP interface to a district provided Telephone Network shall be capable of allowing connected phones to display classroom call-ins, answer internal intercom call-ins, make pages and change priorities of call-ins in progress.
5. Direct dialing, two-way amplified voice intercom between any provided telephone or admin console and speaker without the use of a press-to-talk or talk-listen switch.
6. Ability to upgrade priority level from individual call switch.
7. The ability to answer intercom call-ins registered at administrative consoles and pre-selected telephones.
8. The ability to automatically escalate incoming call-ins to an alternate telephone or group of

telephones if they remain unanswered for a predetermined amount of time.

9. The ability to manually upgrade an intercom call-in to an alternate telephone or group of telephones.
10. The ability for classrooms to “check-in” via push button when they have successfully secured their location during emergency.
11. Administrative console shall display locations that have not checked in to confirm their secured location and provide hands-free audio monitoring and communication to unsecured locations.
12. The controller shall not need direct connection to any classroom via home run or distributed wiring. It shall communicate solely through the IP network.
13. Single button access from any console on the system to distribute emergency announcements within the facility to all or select locations equipped with speakers. Emergency announcements originating from any assigned administrative console shall have priority over all regular system functions.
14. Ability for administrative consoles and connected phones to selectively monitor audio at any two-way speaker during an emergency.
15. Stores a minimum of 48 hours’ worth of Bell Event Schedules, all emergency notification sequences as well as facility wide configuration.
16. System has the ability to sync system time to the Atomic Clock Signal or to the school’s or districts network time server.
17. System’s SIP Interface shall provide:
    a. Audio paging access from any telephone to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire facility.
    b. Ability to answer a call-in directed to that SIP extension.
    c. Ability to upgrade a call-in directed to that SIP extension.
    d. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
    e. Ability to initiate a school-wide emergency including lockdown and evacuate sequences.
    f. SIP device shall display call-in information from call in switch. Information will include a minimum of Classroom Name, Number, and Priority Level.
18. The system will have the ability to utilize a web browser and a USB microphone connected to the PC to deliver district-wide live emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.
19. The system can automatically broadcast emergency instructions throughout an entire campus when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. Bell tones are able to be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.

C. IP Addressable Modules:
1. System shall provide multiple IP Addressable Modules for intercom, paging and relay activation.
    a. All Modules are POE 802.3af compliant
    b. All Modules support DHCP.
    c. All Modules connect to network with a single RJ45 connector
2. IP Addressable Speaker Module
    a. Shall interface to school’s data network, a classroom speaker, and multiple call switches.
    b. A minimum of 5 levels of call-in can be placed from an IP Speaker Module. The call-ins are routed to administrative consoles and select SIP connected telephones and can only be cleared from the system once answered. If a call-in is not answered within a preprogrammed time the call-in may reroute to other telephones, consoles, and speakers.
    c. An option for Privacy call in switches is supported. When the Privacy switch is

activated it prevents administrative or classroom telephones from monitoring the specific classroom/location intercom speaker.

d. The ability to belong to one or more of a minimum of 100 independent zones for zone paging, program/music distribution zones and class change tone zones; this assignment is a programmable function, changeable by time of day. Each IP Speaker Module's location shall be programmed in software to belong to any combination of software zones. IP Speaker Modules shall be designed to mount near ceiling and wall speakers and in the plenum space.

e. Intercom and paging volume adjustable from Software interface.

3. IP Addressable Zone Paging Module
   a. Zone Paging Module shall connect multiple speakers for district all page, all page, zone paging, bells, audio events and, emergency notification.
   b. Zone Paging Modules shall be rack and wall mountable.
   c. Zone Paging Modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio and emergency notification.
4. IP Addressable Aux I/O Module
   a. Aux I/O Module shall have two input contacts and two output contacts.
   b. Input and output contacts are individually addressable.
   c. Aux I/O Module shall be wall and rack mountable.
   d. User can program relays to be activated manually, through an event/bell schedule, or during emergency notification.
   e. Aux I/O Module can perform school lockdown from a single press of a panic button.
5. IP Addressable Program Line Input Module
   a. Program Line Input Module shall provide line level audio program distribution into system.
   b. Program Line Input Module shall have a 3.5mm cable jack.
   c. Program Line Input Module shall be configured via web-based user interface.
   d. User can configure program distribution to be activated manually or automatically through an event/bell schedule.
   e. Program Line Input Module will have a system priority level such that emergency communications override program distribution.

D. IP Addressable Analog Gateway
1. IP Addressable Gateway provides integration with existing analog wiring infrastructure – consisting of shielded two-pair classroom field wiring. The Gateway provides the ability to reuse speaker wiring, speakers, and punch blocks to integrate analog infrastructure with IP platform.
2. Each Gateway will have 5 watts of power per port and 25 watts total per device.
3. Supports 24 classrooms that utilize 25 Volt speakers and all current Telecenter call switches for front office notification.
4. Supports minimum of 5 call switch priorities per classroom, capable of lockdown check-in functionality, while reusing existing shielded two-pair classroom field wiring.
5. Classroom intercom volume adjustable from Software interface.
6. Classroom paging volume adjustable from Software interface.
7. Configured to the school network and can be used in conjunction with IP Addressable Modules.

E. IP Addressable Administrative Console
1. A full color screen with 64 soft keys, 3 line select, volume control, push to talk, speakerphone mode and left/right and up/down scrolling.
2. Audio paging access from any Console to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire school.
3. Programmable soft key access from any console on the system to initiate alarm signals within the school to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative console shall have priority over all regular system functions.
4. Programmable soft key access from any console to automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm

or security systems.

5. Ability to perform intercom to any single IP Addressable Speaker Module.
6. Ability to display 3 call-ins at a time on the screen while other call-ins are annunciating and the ability to scroll to view all call-ins.
7. Ability to upgrade a call-in via soft key.
8. Programmable soft key access from any console for activating relays, campus wide.
9. Ability to maintain, along with controller and other IP Modules system functions, including intercom, bells and paging for the local campus in the event of district-wide connection loss.
10. Classrooms that have not 'checked-in' during an emergency are listed on the Administrative Console's screen.
11. The time duration of an emergency is shown on the screen of the administrative console. The check-in timer is shown on the screen of the administrative console.

F. Audio Paging/Program Amplifiers – Ashly NE 8250

1. Power amplifier(s) shall be provided to provide a minimum of 2 watts of power to all paging speakers, and 15 watts of power to all paging horns.
2. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.

G. Normal/Emergency Call Switch – Rauland Dual Level Call In Switch

1. Normal/Emergency Call Switches indicated on the drawings shall provide the following functions and features:
   a. One (1) "Normal" call switch that shall activate a distinctive "NORMAL" level call from single button activation. The button shall be clearly marked "NORMAL" and will route the call-in to any one or more Administrative Consoles and/or Marquee Displays for quick and easy response from an Administrative Console.
   b. One (1) "Emergency" call switch that shall activate a distinctive "EMERGENCY" level call from single button activation. The button shall be red in color and shall be clearly marked "EMERGENCY" and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.

H. Emergency/Check-In Call Switch – Rauland Check-In Call In Switch

1. Emergency/Check-In Call Switched indicated on the drawings shall provide the following functions and features:
   a. One (1) "Emergency" call switch that shall activate a distinctive "EMERGENCY" level call from single button activation. The button shall be red in color and shall be clearly marked "EMERGENCY" and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.
   b. One (1) "CHECK-IN" call switch that shall activate a distinctive "CHECK-IN" level call from single button activation. The button shall be blue in color and shall be clearly marked "CHECK-IN" and will route the call-in to any one or more Administrative Consoles. This button will be used for emergency check-ins during school emergencies, notifying the front office of the classroom occupants' safety during an emergency.

I. Equipment Racks

1. All equipment racks shall provide 44 spaces (77") minimum for mounted system equipment.
2. All equipment racks shall be multi-rack format ("gangable") style, bolted together, and open cavity.
3. All equipment racks will be provided with lockable rear doors.
4. Equipment rack(s) shall be located in climate-controlled areas/rooms as shown on drawings.
5. All head-end, distribution, and source equipment, including data and power, shall be located in racks configured as approved by the Engineer.
6. Rack mounted equipment shall be accessible from front and rear.
7. All unused rack spaces will be covered with appropriate blank/vent panels.

J. Interior Ceiling Speakers

1. Provide Ceiling Speaker Assembly consisting of 8 Ohm, 8" speaker mounted in a 2 foot by

2 foot, lay-in baffle, with an integrated back box that covers the full area of the baffle.

2. The speaker shall be connected by inserting an 8-pin RJ45 terminated CAT 5e or Cat 6 cable.
3. The speaker shall include provisions to allow attachment of a safety cable if required.

K. Wall Mounted Horns

1. Provide double re-entrant type horn loudspeakers with integral driver. The horn loudspeaker shall be impervious to weather and vandalism. Horn shall be constructed of heavy-duty ABS plastic. Horn loudspeaker drivers shall be rated at 15 watts with a frequency response of 480 Hz to 14 KHz. Sensitivity shall be 106 dB 1 watt, 1 meter. Transformer assembly shall be dual voltage multi-tap type suitable for 25 or 70-volt installations. Dispersion pattern shall be 180 degrees conical. The horn loudspeaker shall be constructed of treated heavy gauge aluminum, with all exposed parts potted and a sealed driver. Wiring terminal shall be fully enclosed. The speaker flange and mounting surface shall have a cork-rubber gasket. The horn loudspeakers finish shall be gray baked on enamel.
2. The recessed back box shall be of heavy gauge cold-rolled steel, spot welded for stability with a rust-retardant gray primer finish. Acoustically treat the interior to eliminate mechanical resonance. The back box shall be 10-3/4”x10-3/4”x6” deep.
3. The baffle shall be vandal proof, the faceplate constructed of 14-gauge carbon steel with a minimum tensile strength of 55,000 PSI. A lattice grid sub-plate shall deny access to the horn but be acoustically transparent for sound projection. Provide tamper proof, stainless steel mounting hardware. The baffle shall a mar/scratch baked epoxy rust inhibitive finish.

L. Uninterruptible Power Supplies (UPS)

1. UPS equipment provided for this system will include Power Conditioning to smooth current and voltage fluctuations.
2. UPS equipment will be sized in accordance with the system manufacturer’s recommendations.
3. Provide an individual UPS for EACH remote gateway outside of the MDF (Gateway) furnished with the system.
4. Provide additional UPS(s) for protection of all other equipment furnished with the system and housed in the equipment racks.
5. All UPS equipment shall be rack mounted.

M. Wall Mounted Volume Control

1. Provide as shown on floor plans. Provide Atlas AT-10PA or approved equal recessed autotransformer volume control. Routine paging shall not override the volume control.

N. Program Source Equipment

1. Provide Qty 1 cd player with blue tooth Interface
2. Provide 1 Program Source Module to interface with the IP Communications system
3. Provide a Mixer Preamp for use in adjusting Sound levels
4. Provide an Interface panel for additional sources and 1 paging Microphone
5. Provide 1 desk top paging Microphone
6. Provide Desktop enclosure to house all program source equipment

O. Additional Equipment:

1. Contractor shall include in their pricing, the cost to furnish and install the following additional equipment. These devices shall be used to fulfill any changes request issued until the list is depleted. Upon the completion of the project, all remaining material shall be delivered to the project for owner stock. No devices shall be used without documentation and written authorization from the project’s technology consultant. Contractor shall obtain a signed transmittal of additional equipment to the owner at the end of the project. The signed transmittal shall be included in the contractor’s closeout documents.
2. Additional Equipment List:
   a. Five (5) Ceiling Mounted Speakers with tile bridges
   b. Two (2) Wall Mounted Volume Controls
   c. One (1) Exterior Speakers

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the School Communications and School Safety Network.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

B. Furnish and install all material, devices, components and equipment for a complete operational system.

C. Impedance and Level Matching: Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.

D. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.

E. All housings are to be located as indicated.

F. The contractor shall provide necessary transient protection on the AC power feed, all copper station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.

G. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

H. Provide physical isolation from speaker-microphone, telephone, line-level wiring, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12-inch minimum separation between conductors to speaker-microphones, telephone wiring and adjacent parallel power. Provide physical separation as recommended by equipment manufacturer for other system conductors.

I. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.

J. Provide integration of local sound reinforcement system override.

K. Provide integration of remote lockdown pushbuttons.

L. Install new speaker types as indicated on the drawings.

M. Speakers in high ambient noise areas (cafetorium, gymnasiums, etc.) shall be tapped as required to overcome the ambient noise generated by the public.

N. Provide silicone sealant to all openings and conduit penetrations at all exterior back box locations.

O. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

P. Conduit and Cables

1. Install conduit, fittings and boxes as specified in Division 26.
2. Single system cables shall be grouped together in a common conduit of adequate capacity to facilitate the ease of installation and prevent conductor or insulation damage.
   a. In no case shall the conduit fill exceed 50% capacity.

b. Do not group conductors or cables of different systems in a common conduit.

3. Cable:
   a. Install cables as recommended by the system manufacturer. Conductor quantities specified are minimum required. Conductors to be installed shall be coordinated with the system equipment supplier.
   b. Cables installed on exposed surfaces, in inaccessible locations, or underground shall be installed in conduit.
   c. Cables installed above accessible, ceiling spaces may be installed without conduit. All cables not installed in conduit shall be plenum rated.
4. Cables not installed in conduit shall be grouped and bundled. Cable shall be bundled on a maximum of 2'-6" on center. Support cables from D-rings or J-hooks. D-rings and J-hooks shall be secured to the structure at a maximum of 5' on center. Bundling and support shall be with plenum rated cable ties.
5. Cables installed in hollow wall spaces shall be installed in conduit to an accessible location.
6. Tag each circuit at each end and at each terminal with a separate tag indicating the area served.

3.3 Additional Requirements

A. Provide visual PA indicator light in deaf education areas.

3.4 GROUNDING

A. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

B. Racks and cabinets shall be grounded to the metallic structure of the building or to the building system power ground in accordance with NEC section 250. Securely bond equipment to the ground system through a minimum 14-gauge green insulated conductor.

C. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

D. Electronic systems shall be grounded to the building system ground, with a maximum resistance of 0.1 ohm. Systems ground shall be a driven ground rod, building steel, or other approved ground of the building power systems ground.

E. Provide all necessary transient protection on the AC power feed and on all copper station lines leaving or entering the building. Note in system drawings, the type and location of these protection devices as well as all wiring information.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Inspection: Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Testing: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.6 FINAL ACCEPTANCE TESTING

A. The Final Acceptance Testing shall be provided to the Owner or the Owners designated

representative only. Final acceptance testing to any other trade or service provider for the project will not comply with the requirements of this section.

B. The contractor will provide a Final Acceptance Test record document signed by both the contractor and the Owner or designated Owner's Representative establishing the "In Warranty" date. The warranty period will not commence until the Final Acceptance Test is completed.

C. Be prepared to verify the performance of any portion of the installation by demonstration, listening and viewing test, and instrumented measurements. Make additional adjustments within the scope of work and which are deemed necessary by the Owner because of the acceptance test.

3.7 COMMISSIONING

A. The contractor shall train the Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. This training will be in accordance with the training as outlined in Section 1.6 of these specifications. In addition to the Training Materials provided, the contractor will also furnish Operators Manuals and Users Guides at the time of this training.

B. Schedule training with Owner through the Owner's representative, with at least seven days advance notice.

3.8 OCCUPANCY ADJUSTMENTS

A. The contractor shall provide Occupancy Adjustments in accordance with Section 1.6 of these specifications. A response scenario amenable to both the owner and the contractor will be established and followed for the first year of service.

3.9 CLEANING AND PROTECTION

A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner's representative.

END OF SECTION

SECTION 28 01 00

OPERATION AND MAINTENANCE (O&M) MANUALS
OF ELECTRONIC SAFETY AND SECURITY SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Compile Electronic Safety and Security (ESS) product data and related information appropriate for Owner's operation and maintenance of products furnished under Contract. Prepare ESS operating and maintenance data as specified in this Section and as referenced in other sections of specifications.

B. Instruct Owner's personnel in operation and maintenance of equipment and systems.

C. Submit three (3) electronic copies, on separate devices (CD, USB Flash Drive, or some type of solid-state storage device), of complete O&M manuals in final form. The submitted manual shall be the system manufacturer’s operations manual, supplemented with operations and maintenance instructions custom tailored for the system installed. Electronic documentation shall be provided in a non-proprietary PDF format, without password restrictions.

D. Hard copies shall be provided upon request of the Owner, Architect, and/or Consultant.

E. Recorded video of all training sessions shall be included in each copy, of each system’s final submitted O&M.

F. The final submitted manual shall include a sing-in sheet and owner/consultant signed acceptance of all training sessions.

1.2 ELECTRICAL OPERATING AND MAINTENANCE MANUAL SUBMITTAL SCHEDULE

A. Thirty (30) days after receipt of reviewed submittals bearing the Project Technology Consultant’s stamp of acceptance (including re-submittals), submit for review, an electronic copy of the first draft of the System’s O&M Manual. This copy shall contain as applicable to the specific system, a minimum of the following:
   1. Table of Contents for each element
   2. Contractor information
   3. All shop drawings, coordination drawings and product data, bearing the Project technology Consultant’s stamp of acceptance.
   4. All parts and maintenance manuals for items of equipment
   5. Warranties (without starting dates)
   6. Certifications that have been completed; submit forms and outlines of certifications that have not been completed
   7. Operating and maintenance procedures.
   8. Form of Owner's Training Program Syllabus (including times and dates)
   9. Control operations / equipment wiring diagrams
   10. Coordination Drawings
   11. Schedule of Low Voltage Wire and Cable
   12. Schedule of ESS Equipment
   13. Schedule of ESS Field Devices
   14. Access Control Door Schedules
   15. Video Surveillance Camera Schedules
   16. Other required operating and maintenance information that are complete.
   17. Cable pathway layout drawings and station map, including through wall and floor penetration locations and sleeve sizes.

B. Copy will be returned to the Contractor within 15 days with comments for corrections.

C. Submit the electronic completed manuals (hard copies upon request) in final form to the Project’s Technology Consultant.

1. Prior to substantial completion for Owner's use after the Owner accepts facility maintenance.
2. Include all specified data, test reports, drawings, dated warranties, certificates, training videos. along with other materials and information.

D. The Project's Technology Consultant shall review the manuals for completeness within 15 days.

E. The Contractor shall be notified of any missing or omitted materials. The Manuals shall be reworked by the Contractor, as required, in the office of the Project's Technology Consultant. The manuals will not be retransmitted.

F. Electronic and/or hard copies of the accepted manuals shall be delivered to the Owner prior to substantial completion.

PART 2 - PRODUCTS

2.1 BINDERS

A. Upon the request for hard copies of the O&M manuals, the binders shall consist of the following configuration:
1. Commercial quality black, 3-ring binders with clear, durable, cleanable plastic covers.
2. Minimum ring size: 1"; Maximum ring size: 3".
3. When multiple binders are used, correlate the data into related groupings.
4. Label contents on spine and face of binder with full size insert. Label under plastic cover.

PART 3 - EXECUTION

3.1 SYSTEM OPERATION AND MAINTENANCE MANUAL

A. Form for Manuals Submitted in Hard Copy Format:
1. Prepare data in form of an instructional manual for use by Owner's personnel.
2. Format:
   a. Size: 8-1/2" x 11"
   b. Text: Manufacturer's printed data or neatly typewritten.
3. Drawings:
   a. Provide reinforced punched binder tab and bind in text.
   b. Fold larger drawings to size of text pages.
4. Provide flyleaf indexed tabs for each separate product or each piece of operating equipment.
5. Cover: Identify each volume with typed or printed title "Operating and Maintenance Instructions". List:
   a. Title of Project
   b. Identity of separate structures as applicable
   c. Identity of general subject matter covered in the manual.
6. Binder as specified

B. Content of Manual:
1. Neatly typewritten Table of Contents for each volume arranged in systematic order as outlined in the specifications.
   a. Contractor, name of responsible principal, address and telephone number
   b. A list of each product required to be included, indexed to content of the volume.
   c. List with each product, name, address and telephone number of:
      1) Subcontractor or installer
      2) Maintenance contractor as appropriate
      3) Identify area of responsibility of each.
      4) Local source of supply for parts and replacement
   d. Identify each product-by-product name and other identifying symbols as set forth in Contract Documents.
2. Product Data:
   a. Include those sheets pertinent to the specific product.
   b. Annotate each sheet to:

1) Identify specific product or part installed.
2) Identify data applicable to installation.
3) Delete references to inapplicable information.

3. Drawings:
   a. Supplement product data with drawings as necessary to illustrate:
      1) Relations of component parts of equipment and systems
      2) Control and flow diagrams
   b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
   c. Do not use Project Record Documents as maintenance drawings.
4. Written text as required to supplement product data for the particular installation:
   a. Organize in consistent format under separate headings for different procedures.
   b. Provide logical sequence of instructions for each procedure.
5. Copy of each warranty, bond and service contract issued
   a. Provide information sheet for Owner's personnel, giving:
      1) Proper procedures in event of failure
      2) Instances that might affect validity of warranties or bonds
6. Shop drawings, coordination drawings and product data as specified.

C. Sections for Equipment and Systems
1. Content for each unit of equipment and system as appropriate:
   a. Description of unit and component parts:
      1) Function, normal operating characteristics, and limiting conditions.
      2) Performance curves, engineering data and tests.
      3) Complete nomenclature and commercial number of replaceable parts.
   b. Operating procedures:
      1) Start up, break-in, routine / normal operating instructions
      2) Regulation, control, stopping, shut down and emergency instructions
      3) Special operating instructions
   c. Maintenance procedures:
      1) Routine operations
      2) Guide to trouble-shooting
      3) Disassembly, repair and reassembly
      4) Alignment, adjusting and checking
      5) Routine service based on operating hours
   d. Manufacturer's printed operating and maintenance instructions.
   e. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
      1) Items recommended to be stocked as spare parts.
   f. Schedule of low voltage wire and cable
   g. Schedule of ESS equipment
   h. Schedule of ESS field devices
   i. Each Contractor's coordination drawings.
      1) As installed color coded wiring and cabling diagrams.
   j. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
   k. Other data as required under pertinent sections of the specifications.
2. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
3. Additional requirements for operating and maintenance data as outlined in respective sections of specifications
4. Provide complete information for products specified in Division 27.
5. Provide certificates of compliance as specified in each related section.
6. Provide start up reports as specified in each related section.
7. Provide signed receipts for spare parts and material.
8. Provide training report and certificates.

END OF SECTION

SECTION 28 05 00

ELECTRONIC SAFETY AND SECURITY
BASIC MATERIALS, METHODS, AND GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Except as modified in this Section, General Conditions, Supplementary Conditions, applicable provisions of Division 01 General Requirements, and other provisions and requirements of the Contract Documents apply to work of Division 28 Electronic Safety and Security.

B. Applicable provisions of this section apply to all sections of Division 28, Electronic Safety and Security.

C. The general provisions of the Contract and the requirements of the following Sections apply to the Work specified in this Section. See following sections for related general and specific requirements following sections shall associate with this specification as applicable.
1. Division 26 in its entirety.
2. Division 27 in its entirety.
3. Division 28 in its entirety.

D. The entire drawing and specification package apply to the work specified in the Electronic Safety and Security specifications and shall be complied with in every respect. The Contract Documents are comprised of the drawings and specifications. The Contractor shall examine these Contract Documents, and coordinate required work indicated in each.

1.2 CODES AND STANDARDS

A. All equipment and work performed shall comply with all of the current and applicable Codes, Rules, Ordinances, Regulations and Standards (including those not specifically listed in this Specification) as interpreted and enforced by the authorities having jurisdiction including:
1. Americans with Disabilities Act (ADA)
2. Authorities Having Jurisdiction (AHJ) - Local
3. American National Standards Institute (ANSI)
4. American Society of Testing and Materials (ASTM) *Communications Cables - B694, B736, D4565, D4566, D4730, D4731, D4732*
5. Building Industry Consulting Services International (BICSI)
6. Code of Federal Regulations - Title 47
7. Electronics Industries Association (EIA) *Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices - EIA-455 Series*
8. Federal Communications Commission (FCC) - Communications Act and FCC Rules
9. Federal Information Processing Standards (FIPS) *Federal Building Standard for Telecommunications Pathways and Spaces - FIPS PUB 175, FIPS PUB 176*
10. The Insulated Cable Engineers Association (ICEA) *Communications Cable Stands - P-47-434, S-56-434, S-80-576, S84-608, S-85-625, S-86-634, S-87-640, S-89-648, S-90-661, S-98-688, S-99-689, S-100-685*
11. International Electro-technical Commission (IEC)
12. Institute of Electrical and Electronic Engineers (IEEE) *Local Area Networks/Metropolitan Networks Standards Collection - LAN/MAN 802 Series*
13. International Organization for Standardization (ISO) (ISO/IEC) *Premise Wiring Core and LAN/MAN Core Equivalents-11801, 8802, 14763-1*
14. International Telecommunication Union (ITU-T) *Telecommunications Standardization*
15. National Electrical Code (NEC) *National Electrical Code - NFPA 70*
16. National Electrical Contractor's Association (NECA) *Standards of Installation*
17. National Electrical Manufacturers Association (NEMA) *Performance Standard for Twisted Pair Premise Voice and Data Communications Cable-WC 63.1, WC 63.2, WC 66*
18. National Electrical Safety Code (NESC)
19. National Fire Protection Association (NFPA) - *National Fire Alarm Code NFPA 72, Life Safety Code NFPA 101*

20. Society of Cable Telecommunications Engineers (SCTE)
21. Local Accessibility Standards
22. Telecommunications Industries Association (TIA) *(ANSI/TIA/EIA) Wiring and Cabling Standards - 526, 568, 569, 570, 571, 598, 606, 607, 758, TSB 31-B, 63, 67, 72, 75 and 95*
23. Uniform Building Code (UBC)
24. Underwriters Laboratories, Inc. (U.L.) - *497A, 910, 1077, 1863, 1283, 1459, 1604, 1651, 1681, 1690, 1778, 1977*

B. Resolve any code violations discovered in contract documents with the Engineer prior to award of the contract. After Contract award, any correction or additions necessary for compliance with applicable codes shall be made at no additional cost to the Owner.

C. This Contractor shall be responsible for being aware of and complying with asbestos NESHAP regulations, as well as all other applicable codes, laws and regulations.

D. Obtain all permits required.

1.3 SUMMARY

A. The work covered by the specifications includes furnishing materials, labor, transportation, tools, permits, fees, utilities, and incidentals necessary for the complete installation of work required in the Contract Drawings.

B. It is the intent of the Contract Documents to provide a new and/or an extension of the existing installation, as shown in the associated specifications and drawings, complete in every respect.

C. Provide complete and working ESS Systems including equipment, conduit, wiring, material, labor and training as described in this Specification and the Drawings. The ESS Systems Drawings and Specifications are the sole property of the Architect and are not to be duplicated, scanned, loaned or in any way made available to persons not designated as authorized by the Architect. All ESS Systems plans and specifications are to be returned to the Architect following completion of bid.

1.4 CONTRACTOR'S QUALIFICATIONS

A. An approved contractor for the work under this division shall be:
1. A specialist in this field and have the personnel, experience, training, and skill, and the organization to provide a practical working system.
2. Able to furnish evidence of having contracted for and installed not less than ten (10) systems of comparable size and type that have served their Owners satisfactorily for not less than 3 years.
3. Perform work by persons qualified to produce workmanship of specified quality. Persons performing work shall be required to be licensed. Onsite supervision shall have minimum of the following:
    a. Licenses, as applicable to the system being installed
    b. Manufacturer's Certifications
        1) Firm Certification
        2) Installer Certification
        3) Programmer's Certification
        4) System Designer Certification.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

B. If variations or departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Consultant for review. No departures shall be made without prior written acceptance of the Consultant.

C. Should the drawings or specifications disagree in themselves or with their counterpart, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise

directed by the Consultant in writing, shall be performed or furnished. In the case that the specifications should not fully agree with the Schedules, the latter shall govern. Figures indicated on drawings govern scale measurements and large-scale details govern small scale drawings.

D. The approximate locations of system equipment and components are indicated on the Drawings. These Drawings are not intended to give complete and accurate details in regard to location of equipment, field devices, etc. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the Review of the Owner or Consultant, who reserves the right to make any reasonable changes in the locations indicated without additional cost to the Owner.

E. Items specifically mentioned in the Specifications but not shown on the Drawings and/or items shown on Drawings but not specifically mentioned in the Specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

F. Any discrepancies between the Contract Documents and actual job site conditions shall be reported to the Owner or Consultant, so that they will be resolved prior to the bidding, where this cannot be done at least 7 working days prior to bid; the greater or costlier of the discrepancy shall be bid. All labor and materials required to perform the work described shall be included as part of this Contract.

G. It is the intention of this Section of the Specifications, and associated drawings, to outline minimum requirements to furnish the Owner with a turnkey and fully operating system in cooperation with other trades.

H. The contract documents are schematic in nature in that they are only to establish scope and a minimum level of quality. They are not to be used as actual working construction drawings. The actual working construction drawings shall be the shop drawings accepted by project’s consultant.

I. The Contractor shall be responsible for coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with the existing site conditions, details of the work and the working conditions, and verify dimensions in the field. The Contractor shall advise the project’s consultant of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor's site visit; coordination of existing conditions and include consideration for existing conditions.

J. These documents are conceptual in nature. It shall be the responsibility of the approved installer to furnish a complete and functional system, including the items shown on the drawings, in the specifications, and items not designated in either. The installer’s shop drawings and product data submittals shall represent a complete system and documents accepted by the project’s consultant shall not relieve the installer from being required to provide any materials, equipment, or labor to furnish a complete and functional system as recognized by the Project’s Technology Consultant and the Owner.

1.6 BUILDING CONSTRUCTION AND LAYOUT OF WORK

A. General: It shall be the responsibility of the Contractor to consult the Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The drawings are diagrammatic in nature and do not show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of all codes, ordinances, and standards; as well as all structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in closed ceiling space and/or furred chases unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.

C. The approximate location of equipment items is indicated on the drawings. Exact locations are to be determined by coordination of dimensions from approved equipment submittals and site-verified

field measurements and will in all cases be subject to the approval of the Consultant. The Consultant reserves the right to make any reasonable changes in the indicated locations prior to installation for no additional cost.

D. In areas of existing special ceiling construction, the removal and restoration must be carefully planned such that the existing condition of the ceilings is maintained. It may be necessary for the Contractor to procure a Subcontractor familiar with this work to achieve this requirement.

E. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.

1.7 RELATION WITH OTHER TRADES

A. Carefully study all matters and conditions concerning the project. Submit notification of conflict in ample time to prevent unwarranted changes in any work. Review other Divisions of these specifications to determine their requirements. Extend electrical services and final connections to all items requiring same.

B. Because of the complicated relationship of this work to the total project, conscientiously study the relation and cooperate as necessary to accomplish the full intent of the documents.

C. Where cabling pass through walls or floors, metal sleeves shall be provided and shall be sealed to prevent spread of fire and smoke. In walls, they shall extend 3” beyond the finished surface. In pipe chases, they shall extend 8” inches above floor slab and be cemented in a watertight manner. Size of these sleeves shall be at least as required to maintain a maximum 40% conduit fill ratio.1/2 inch greater than outside diameter of the conduit.

D. Locate and size openings required for installation of work specified in this Division in sufficient time to prevent delay in the work.

E. Refer to other Divisions of the specifications for the scope of required connections to equipment furnished under other Division. Determine from the General Contractor / Construction Manager for the various trades, the Owner, and by direction from the Architect / Engineer, the exact location of all items. The construction trades involved shall furnish all roughing-in drawings and wiring diagrams required for proper installation of the electrical work.
1. Make final connections to all ESS equipment indicated on the drawings, except as noted.

F. Request all Shop Drawings required in ample time to permit proper installation of all electrical provisions.

G. Extend services as indicated to the various items of equipment furnished by others. Rough-in for the various items and make final connections ready for operation upon placing of the equipment.

1.8 CONCEALED AND EXPOSED WORK

A. When the word "concealed" is defined as hidden from sight as in chases, furred spaces or above ceilings. "Exposed" is defined as open to view, in plain sight.

1.9 GUARANTEE

A. Guarantee work for a minimum of two years or as noted longer elsewhere from the date of substantial completion of the project. During that period make good any faults or imperfections that may arise due to defects or omissions in material, equipment or workmanship. At the Owner's option, replacement of failed parts or equipment shall be provided.

1.10 MATERIAL AND EQUIPMENT

A. Furnish new and unused materials and equipment meeting the requirements of the paragraph specifying acceptable manufacturers. Where two or more units of the same type or class of equipment are required, provide units of a single manufacturer.

1.11 NOISE AND VIBRATION

A. Select equipment to operate with minimum noise and vibration. If noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, and judged objectionable by the Owner, Architect, or Engineer, rectify such conditions at no additional cost to the Owner. If the item of equipment is judged to produce objectionable noise or vibration, demonstrate at no additional cost that equipment performs within designated limits on a vibration chart.

1.12 ACCEPTABLE MANUFACTURERS

A. Manufacturers names and catalog number specified under sections of Division 28 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a named manufacturer shall be acceptable on approval. A request for prior approval of equipment not listed must be submitted ten (10) days before proposal due date. Submit complete design and performance data to the Architect. The Architect and Owner issue approvals of acceptable manufacturers as addenda to the Construction Proposal Documents.

B. Where acceptable manufacturers are listed, only products of those manufacturers may be provided. Additionally, the product must meet all the detailed requirements of the specifications.

C. If no manufacturer’s name is mentioned, the Contractor shall provide equipment and material which meet the specifications.

1.13 UTILITIES, LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work:
1. Obtained from utility maps and other substantially reliable sources.
2. Are offered separate from the Contract Documents as a general guide only without guarantees to accuracy.

B. Examine the site and verify the location and elevation of all utilities and of their relation to the work. Existing utilities indicated on the site plans are for reference only and shall be field verified by the Contractor with the respective public or private utility.

1.14 CONTRACT DRAWINGS

A. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work. Determine exact locations from field measurements.

B. It is the responsibility of the Contractor to compare the scale of all electrical drawings with the scale of the architectural drawings and make adjustments to all electrical drawings which have the incorrect drawing scale so that his material takeoffs are not in error due to an incorrectly labeled drawing scale and his proposal is complete.

1.15 ABBREVIATIONS AND DEFINITIONS

Abbreviations:

A/V	Audio/Visual
AWG	American Wire Gauge
BCR	Building Communications Room
CMP	Communications Media Plenum
CMR	Communications Media Riser
dB	Decibel
EMI	Electromagnetic Interference
ER	Equipment Room
ESS	Electronic Safety and Security
FACP	Fire Alarm Control Panel
FCR	Floor Communications Room
Hz	Hertz

IDF	Intermediate Distribution Frame
Km	Kilometer
LCD	Liquid Crystal Display
LED	Light Emitting Diode
M	Micron
MDF	Main Distribution Frame
MHz	Megahertz
NEXT	Near-End Cross Talk
nm	Nano-meter
OFN	Optical Fiber Non-conductive
OFNP	Optical Fiber Non-conductive Plenum
OFNR	Optical Fiber Non-conductive Riser
OTDR	Optical Time Domain Reflectometer
TC	Telecommunications Closet *(Now referred to as TR)*
TR	Telecommunications Room *(A.K.A. TC - Telecommunication Closet)*
UTP	Unshielded Twisted Pair Wire

Definitions:

Low Voltage Wire - Wire or cable used for one or more systems that operate on 24 volts or less. Low Voltage Wire is used to install and interconnect one or more of the ESS Systems. Low Voltage Wire includes patch cords, jumpers and all portions of cable or wire used to make the ESS Systems operational or for system communications.

Electronic Safety and Security Systems - One or more of the following and associated equipment: Fire Detection/Alarm Systems, Intrusion Detection/Alarm Systems, Access Control Systems, Video Surveillance Systems,

1.16 QUALITY ASSURANCE

A. Equipment Standards:
1. System and all components shall be brand new stock from manufacturer.
2. All electronics shall be 100% solid state.
3. System and all components shall bear a UL Label.

B. Contractor Qualifications:
At the time of Proposal, the Contractor shall:
1. Have manufactured, supplied or installed at least three (3) other systems of similar size, complexity, and general operation as the systems described in these specifications. The Contractor shall furnish in writing to Architect proof of compliance with this paragraph at the time of proposal.
2. Hold all legally required Texas State Contractor's licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. The Contractor shall submit copies of licenses to the Architect prior to the start of work
3. Hold all legally required state registrations to meet local requirements for submittal drawings.
4. Have a local office within fifty (50) miles of the project site staffed with factory trained technicians who have experience on systems of similar complexity and function as the systems described in these specifications. These technicians shall be fully capable of system engineering support, installation supervising, system start-up, and providing the Owner with training and service on both hardware and software for the systems specified.
5. Certify complete and total compliance with the provisions of these specifications by letter or submittal of the proposal response forms, signed by an officer of the corporation, or a principal if other ownership currently exists. In addition, the letter or forms shall include a complete listing of exceptions, if any.

1.17 SUBMITTALS

A. Provide SUBMITTALS according to Division 1 and the following.

B. Requirements:
   1. Submit paragraph-by-paragraph specification review indicating compliance or deviation with explanation.
   2. Submit proof that all system components and cables are U.L. Listed.
   3. An equipment list with names of manufacturers, model numbers, and technical information on all equipment proposed. Clearly mark exact model number proposed to be installed.
   4. Product technical information sheets for each principal components in the proposed system, including cable, wire, terminal marking, and wire marking material.
   5. Certification from the manufacturer stating that the system Contractor is an authorized distributor or installer of the proposed system when such certifications exist.
   6. A statement listing every technical and operational parameter wherein the submitted equipment varies from that which was originally specified. If the submitter fails to list a particular variance and his submittal is accepted, but is subsequently deemed to be unsatisfactory because of the unlisted variance, the submitter shall replace or modify such equipment at once and without cost to the Owner.

1.18 EXAMINATION OF SITE

A. The Contractor shall have visited the site and familiarized himself with all existing conditions prior to submitting his proposal and shall be prepared to carry out the work within the existing limitations. Failure or neglect to do so shall not relieve the Contractor of his responsibilities not entitle him to additional compensation for work overlooked and not included in his proposal.

B. The Contractor shall confirm the availability of the proper power source for each piece of specified equipment, through site visits and Drawings as necessary. Where proper power does not exist, the Contractor shall provide the required power, circuits, outlets, conduits, and wire as specified under Division 26.

1.19 DATA ACCURACY

A. Absolute accuracy of information regarding existing conditions cannot be guaranteed. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, elevations, etc., shall be governed by actual field conditions. Where variations from the contract documents are required, such variations shall be approved by the Architect / Owner.

1.20 SECURITY

A. The Contractor is responsible for complying with all of the Owner's and facility security's requirements to prevent theft or damage to equipment, tools and materials. If any deviation from facility security requirements is necessary, approval for such deviation shall be coordinated with the Owner.

B. The Contractor shall not disclose any confidential information of the Owner. The Contractor acknowledges that such action is highly injurious and can do damage to the Owner. The Contractor will agree to and comply with the standard policies and provisions of the Owner regarding outside Contractors and Consultants.

1.21 UTILITIES

A. It shall be the responsibility of the Contractor to provide all temporary connection and cables, lighting, light stands and power. The facilities shall be used in accordance with all applicable regulations regarding operations, safety and fire hazards of the governmental Authorities Having Jurisdiction, provided they are not used in a wasteful manner.

1.22 PERMITS

A. All permits required for the specified performance and completion of the work shall be secured by the Contractor. These permits shall be presented and reviewed at the initial project progress meeting.

1.23 NOTIFICATION

A. The Contractor shall not shut off any existing systems. The Contractor shall give the Owner at least ten (10) calendar day's notice of any requirements to shut off or interference with existing alarm, regulating, computer or other service systems. The Owner will arrange and execute any shutdown. All work such as splicing, connections, etc., necessary to establish or re-establish any system shall be completed by the Contractor in close coordination with the Owner.

1.24 INTERFERENCES WITH THE OWNER

A. Transportation and storage of materials at the facility, work involving the facility, and all other matters affecting the habitual use by the Owner of its buildings, shall be conducted so as to cause the least possible interference, and at times and in a manner acceptable to the Owner. The Contractor shall make every effort to delivery equipment per the schedule required by the project.

1.25 PROJECT RECORD DOCUMENTS

A. Maintain at the job site a separate set of white prints (blue line or black line) of the contract drawings for the sole purpose of recording the "as-built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, reproducible drawings clearly indicating locations of various major and minor feeders, equipment, and other pertinent items, as installed. Record underground and underslab cables installed, dimensioning exact location and elevation of such installations.

B. At conclusion of project, obtain without cost to the Owner, electronic AutoCAD 2014+ / Revit CAD files of the original drawings and transfer as-built changes to these. Provide the following as-built documents including all contract drawings regardless of whether corrections were necessary and include in the transmittal: "2 sets of CDs and prints for Owner's use, one set of CDs, prints, and mylars for Architect / Engineers Records". Delivery of these as-built electronic, reproducible and prints is a condition of final acceptance.
   1. 3 sets of electronic AutoCAD (2014+ dwg) / Revit CAD drawing files, on CD-ROM media, of each contract as-built drawing.
   2. One reproducible Dayrex mylar film positive of each contract as-built drawing.
   3. Three sets of blue or black-line prints of each contract as-built drawing.

C. As-Built Drawings should indicate the following information as a minimum:
   1. Indicate all addendum changes to documents.
   2. Remove Engineer's Seal, name, address, and logo from drawings.
   3. Mark documents AS-BUILT DRAWINGS.
   4. Clearly indicate: DOCUMENT PRODUCED BY:
   5. Indicate all changes to construction during construction. Indicate actual routing of all conduit and cables, etc that were deviated from construction drawings.
   6. Indicate exact location of all underground ESS raceways, and elevations.
   7. Correct schedules to reflect (actual) equipment furnished and manufacturer.
   8. During the execution of work, maintain a complete set of Drawings and specifications upon which all locations of equipment, devices, and all deviations and changes from the construction documents in the work shall be recorded.
   9. Exact location of all ESS equipment in building. Label panel schedules to indicate actual location.
   10. Exact location of all ESS equipment in and outside of the building.
   11. Location, size and routing of all ESS cables, conduits, equipment, etc. shall be accurately and neatly shown to dimension.
   12. Exact location of all roof mounted equipment, wall, roof and floor penetrations.
   13. Cloud all changes.

1.26 OPERATING TESTS

A. After all ESS systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequencing and operation throughout the range of operation. Tests shall be made in the presence of the Architect / Engineer and Owner.

Provide minimum 24-hour advance notice of scheduling of all tests. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections. Submit 3 copies of all certifications and test reports adequately in advance of completion of the work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

1.27 WARRANTY

A. All equipment shall be covered for the full manufacturers warranty period and systems shall be warranted by the Contractor for a period of two years commencing with the filing date of substantial completion. The Warranty shall cover all costs for warranty service, including parts, labor, prompt field service, pick-up, transportation, delivery, reinstallation, and retesting. A contract for service shall cover the period starting with the first expected activation of each system and shall continue without interruption to cover the period to the end of the two-year warranty as defined above. The end of the warranty period shall be handled such that a smooth transition to a maintenance agreement with the Owner shall be achieved with no lapse in coverage.

B. Submit 3 copies of all warranties and guarantees for systems, equipment, devices and materials. These shall be included in the Operating and Maintenance Manuals.

1.28 BUILDING CONSTRUCTION

A. It shall be the responsibility of the sub-contractor to consult the Architectural and Engineering drawings, details and specifications and thoroughly familiarize himself as to the construction and all job-related requirements. All construction trades shall cooperate with the General Contractor / Construction Manager job site superintendent and lay out work so that all piping, cables, pathways, raceways, and other items are placed in the walls, furred spaces, chases, etc., so that there shall be no delay in the job.

1.29 TEMPORARY FACILITIES

A. General: Refer to Division 01 for general requirements on temporary facilities.

B. Temporary Wiring: Temporary power and lighting for construction purposes shall be provided under Division 26. Installation of temporary power shall be in accordance with NEC Article 305.

C. Temporary facilities, wire, lights and devices are the property of this Contractor and shall be removed at the completion of the Contract.

1.28 EXTRA MATERIALS

A. Keys: Provide three (3) sets of all keys for system cabinets.

PART 2 - PRODUCTS

2.1 WORK INCLUDED

A. All materials listed in PART 2 - PRODUCTS of this Division Sections and on the Drawings shall be provided by the Contractor unless specifically excluded or modified in other portions of this Specification or Addendums.

2.2 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

A. Materials, in general, shall conform to the National Electrical Code requirements and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the UL label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped testing agency, indicating that the items have been tested in accordance with required procedures, and that the materials and equipment comply with all Contract requirements.

2.3 STANDARD PRODUCTS

A. Materials and equipment shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications and shall essentially duplicate materials and equipment that have been in satisfactory use at least two (2) years prior to bid opening. Where custom or special items are required, these shall be fully described using drawings, material lists, etc., which fully describe in detail the item proposed for use on this project.

2.4 MANUFACTURE'S INSTRUCTIONS

A. The Contractor is responsible for furnishing the proper Electronic Safety and Security equipment and/or material and for seeing it is installed as intended by the manufacturer. The Contractor shall, wherever necessary, request advice and supervisory assistance from equipment manufacturers as required for the proper installation, operation, or start-up. The Contractor shall notify the Consultant, in writing, of any conflict between the Contract Documents and the manufacturer's recommendations and shall obtain, from the Consultant, instructions/direction before proceeding with the work. The Contractor shall pay for all costs resulting from deficiencies created by installation not in accordance with the manufacturer's recommendations or the instructions of the Consultant.

2.5 RUST PREVENTION

A. Metallic materials shall be protected against corrosion. Exposed metallic parts of equipment exposed to the elements shall be given a rust inhibiting treatment and standard finish by the manufacturer. Components such as boxes, bodies, fittings, guards, and miscellaneous parts shall be protected in accordance with the ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.6 STORAGE AT SITE

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust, or physical damage.

B. All electronic equipment, containing sealed lead acid batteries or gel cells, shall be stored in climate-controlled area until installed or reinstalled. Do not store in non-climate controlled connex storage units.

C. Storage is to be provided and secured by the contractor. In the event that the Owner should agree to furnish storage space, security of the space and its contents shall remain the responsibility of the contractor.

2.7 CONDITION OF MATERIALS

A. All materials required for the installation of the Electronic Safety and Security systems shall be new and unused. Any material or equipment damaged in transit from the factory, during delivery to premises, while in storage on premises, while being installed, or while being tested, until time of final acceptance, shall be replaced by this Contractor without extra cost to Owner.

2.8 NAMEPLATES

A. Factory assembled components and equipment shall be provided with be factory stamped labeling. Labeling will have information required to specifically identify the component and/or equipment in the future such as the manufacturer's name, catalog number, serial number, etc. All data on the labels shall be legible at the time of final inspection.

2.9 ACCESS DOORS

A. Wherever access is required in walls or ceilings to concealed junction boxes, pull boxes, equipment, etc., installed under this Division, furnish a hinged access door and frame with flush latch handle to another Division for installation. Doors shall be as follows:

1. Plaster Surfaces: Milcor Style K.
2. Ceramic Tile Surfaces: Milcor Style M.
3. Drywall Surfaces: Milcor Style DW.
4. Install panels only in locations approved by the Architect.

2.10 SPACE LIMITATIONS

A. Equipment shall be chosen which shall properly fit into the physical space provided and shown on the drawings, allowing ample room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearances in accordance with applicable codes and standards. Physical dimensions and arrangement of equipment shall be subject to the approval of the Consultant.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. This project has a critical path, which must be closely followed in order to meet the completion date. The Contractor shall review the proposed schedule at the Award of Contract meeting and be prepared to staff his work force according to the schedule constraints presented at that time.

B. Aesthetics are an important consideration in this installation. All components shall be installed so as to have aesthetically pleasing results as determined by the Owner and Architect. Actual locations of all visible components shall be coordinated in advance with the Owner and Architect.

C. Install, make fully operational and test the system as indicated on the Drawings and in the Specifications. Where information is not available the worst-case condition must be assumed to ensure a complete, functional system.

D. Any interfacing with other systems shall be the Contractor's responsibility under this contract, and the details, both logical and physical, of such interfaces shall be reflected in the Submittals and As-Built drawings.

E. If appropriate, interfaces with the Owner's Data Network or Telecommunications System shall be coordinated with the Owner and Architect.

F. All necessary back boards, back-boxes, pull-boxes, connectors, supports, conduit, cable and wire shall be furnished and installed to provide a complete and reliable system. Exact location of all backboards, boxes, conduit and wiring runs shall be presented to the Owner / Architect for approval in advance of any installation. Provide as required and as specified in Division 26.

G. Where required provide 120-VAC, 60 Hz power from nearest electrical panel through a junction box, to the system devices. Provide as required and as specified in Division 26.

H. Where required, install conduit, cable and wire parallel and square with building lines, including raised floor areas. Conduit fills shall not exceed 40%.

I. All equipment shall be mounted with sufficient clearance to minimize EMI as well as meet all applicable codes and facilitate observation and testing. Securely hand and/or fasten with appropriate fittings to ensure positive grounding, free of ground loops, throughout the entire system. Units shall be installed parallel and square to building lines.

J. Quiet and vibration-free operation of all equipment is a requirement of this installation. Properly adjust, repair, balance or replace any equipment producing objectionable (in the judgment of the Owner or Architect) noise or vibration in any of the occupied areas of any building and provide additional brackets and bracing if necessary. Any such additions or changes shall be at no additional cost to the Owner.

K. Installation shall comply with the CODES AND STANDARDS portion of this Section. Where more than one code or regulation if applicable, the more stringent shall apply.

L. Where new equipment is replacing old equipment, the Contractor is responsible for removing and disposing of the old equipment and doing whatever repair work is necessary as specified by the Owner / Architect.

M. Install firestopping, as specified in Division 26 for all penetrations in slabs and firewalls to meet code at the completion of work and prior to final testing demonstration to the Owner.

N. The installation shall be performed in a professional manner.

O. On a daily basis, clean up and deposit in appropriate containers all debris from work performed under the appropriate specification sections. Stack and organize all parts, tools and equipment when not being used.

P. Preparation, handling and installation shall be in accordance with the Manufacturer's written instructions and technical data appropriate to the product specified.

Q. All work shall conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

R. At the conclusion of the installation, all work areas, including all enclosures and boxes, shall be vacuumed and cleaned to remove all debris and grease.

3.2 COORDINATION WITH OWNER / ARCHITECT

A. Close coordination with the Owner / Architect is vital to achieve a complete, aesthetically pleasing job. The Contractor shall ensure that the Owner / Architect is kept fully apprized of job progress.

3.3 CUTTING, PAINTING, AND PATCHING

A. Structural members shall not be drilled, bored or notched in such a manner that shall impair their structural value. Cutting of holes in structural members, if required, shall be done with core drills and only with the specific approval of the Owner / Architect for each instance.

B. All walls that require cutting or repair during the installation process shall be returned to their original condition, including the matching of colors and finishes to the satisfaction of the Owner / Architect, and at no additional cost to the Owner.

3.4 WIRE AND CABLE

A. All low voltage cable shall be low smoke plenum rated, limited energy, with 300-volt insulation.

B. All wires in exposed areas shall run through conduit as specified in Division 26.

C. Provide conduits, cable trays, raceways, wireways, boxes and outlets as specified in Division 26.

D. After installation, and before termination, all wiring shall be checked and tested to insure there are no grounds, opens, or shorts on any conductors. In addition, all wires between buildings or underground and all coax cables shall have insulation tested with a megohmeter (megger) and a reading of greater than 20 megohms shall be required to successfully complete the test.

E. Run wires continuously from termination to termination without splices.

F. Wire and cable shall be supported in each equipment and terminal cabinet and in each terminal and pull box in vertical risers and horizontal runs with wire duct and strap-type supports. At any point where wire duct is required for good wire management, whether shown on elevations or not, install appropriate duct. Where terminal boards are used, wire ducts shall be supplied on both sides and at not rime shall wires cross over terminal boards. Arrange cables neatly to allow inspection, removal and replacement. Lace cables as required. Spot tie wire bundles with plastic cable ties and securely affix to panels. If screw type terminals are specified, terminal strip connections shall be locking, tongue style, pressure crimp, and solderless spade lug.

G. Visually inspect wire and cable for faulty insulation prior to installation. Protect cable ends at all times with acceptable end caps except during actual termination. At no time shall any coaxial cable be subjected to a bend less than a 6-inch radius. Protect wire and cable from kinks. Install 1 pull rope for all 2” or larger sized conduits.

H. Provide plastic bushings and strain relief material at all conduit exit points and where necessary, to avoid abrasion of wire and excess tension on wire and cable.

I. Cables above accessible ceilings shall not rest on ceiling tiles. Use Velcro tie wraps, J-hooks or D-rings to hold cables. Provide independent support for all cables. Support is to be from building structure (do not support from pipes or conduits). ESS cables shall not tie off on HVAC supports, all-thread, ceiling grid hanger wire or electrical / mechanical piping system.

J. Ground and bond equipment and circuits in accordance with NEC and Division 26.

3.5 IDENTIFICATION AND TAGGING

A. All cables, wires, wiring forms, terminal blocks and terminals shall be identified by labels, tags to other permanent markings in accordance with TIA/EIA-606. The markings shall clearly indicate the function, source, or destination of all cabling, wiring and terminals. All cables and wires shall be identified, utilizing heat-shrink, machine printed, polyolefin wire markers (Brady Type B-32 *or equal*). Handwritten tags are not acceptable.

B. Should a situation arise where the wire tagging format as shown on the drawings cannot be used, a substitute format shall be submitted which complies with the intent to provide documentation that will permit end-to-end tracing of all ESS Systems wiring.

C. All panels shall be provided with permanently attached engraved lamacoid labels with identifying names and functions. All terminal points shall be appropriately labeled. Labels shall be consistent in form, color, and typeface throughout the system and all must contain the name of the system or subsystem as part of the label textual information. Design, color, font and layout shall be coordinated with, and approved by, the Owner.

D. Identification of Equipment:
1. All major equipment shall have a manufacturer's label identifying the manufacturer's address, equipment model and serial numbers, equipment size, and other pertinent data. Take care not to obliterate this nameplate. The legend on all nameplates or tags shall correspond to the identification shown on the Operating Instructions.
2. A black-white-black 3-layer laminated plastic engraved identifying nameplate shall be permanently secured to each wireway, terminal cabinet, and ESS cabinet or rack.
   a. Identifying nameplates shall have 1/2-inch high, engraved letters.
3. Permanent, waterproof, black markers shall be used to identify each ESS grid junction box, clearly indicating the type of system available at that junction box.
4. Pull Boxes: Field work each with a nameplate showing identity, and identifying equipment connected to it. Nameplates shall also indicate where pull box is fed from.

E. Prohibited Markings: Markings intended to identify the manufacturer, vendor, or other source from whom the material has been obtained are prohibited for installation in public, tenant, or common areas within the project. Also prohibited are materials or devices that bear evidence that markings or insignias have been removed. Certification, testing (example, Underwriters Laboratories), and approval labels are exceptions to this requirement.

F. Warning Signs: Provide warning signs where there is hazardous exposure associated with access to or operation of ESS facilities. Provide text of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with industry standards for color and design.

G. Wire and Cable Labeling: Provide wire markers on each conductor in all boxes, pull boxes, gutters, wireways. Identify with drop/circuit number.

H. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch wide plastic tape,

colored red or orange with suitable warning legend describing buried ESS lines. All underground conduits shall be so identified. Tape shall be buried at a depth of 6-inches below grade and directly above conduits or ductbanks. Provide magnetic marking tape below all underground conduits.

3.6 CUTTING AND PATCHING

A. General: Comply with the requirements of Division 01 for the cutting and patching of other work to accommodate the installation of electrical work. Except as authorized by the Architect / Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.

3.7 INSTRUCTION OF OWNER'S PERSONNEL

A. Before proceeding with the instruction of Owner Personnel, prepare a typed outline, listing the subjects that will be covered in this instruction, and submit the outline for review by the Owner. At the conclusion of the instruction period obtain the signature of each person being instructed on each copy of the reviewed outline to signify that he has a proper understanding of the operation and maintenance of the systems and resubmit the signed outlines.

B. Prior to substantial completion, conduct an on-site training program to instruct Owner's operating personnel in the operation and maintenance of the ESS systems.
1. Provide the training during regular working day.
2. The Instructors shall be experienced in their phase of operation and maintenance of the electrical systems and with the project.

C. Time to be allocated for instructions.
1. Minimum of 12 hours dedicated instructor time
2. 4 hours on each of 3 days
3. Additional instruction time for specific systems as specified in other Sections.

D. Before on-site training, submit the program syllabus; proposed time and dates; for review and approval, minimum 48 hours prior to proposed training time and date.
1. One copy to the Owner
2. One copy to the Architect / Engineer

D. The Owner shall provide a list of personnel to receive instructions and shall coordinate their attendance at the agreed upon times.

E. Use operation and maintenance manuals as the basis of instruction. Review manual with personnel in detail. Explain all aspects of operation and maintenance.

F. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shut down of each item of equipment.

G. Demonstrate equipment functions (both individually and as part of the total integrated system).

H. Prepare and insert additional data in the operating and maintenance manuals when the need for additional data becomes apparent during instructions.

I. Submit a report within one week after completion of training. List time and date of each demonstration, hours devoted to the demonstration, and a list of people present, with their respective signatures.

J. At the conclusion of the on-site training program, have the person designated by the Owner sign a certificate to certify that he/she has a proper understanding of the system, that the demonstrations and instructions have been satisfactorily completed, and the scope and content of the operating and maintenance manuals used for the training program are satisfactory.

K. Provide a copy of the report and the certificate in an appropriately tabbed section of each Operating and Maintenance Manual.

3.8 OPENINGS

A. Framed, cast or masonry openings for boxes, equipment or conduits are specified under other divisions. Drawings and layout work for exact size and location of all openings are included under this division.

3.9 OBSTRUCTIONS

A. The drawings indicate certain information pertaining to surface and subsurface obstructions, which has been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
   1. Before any cutting or trenching operations are begun, verify with Owner's representative, utility companies, municipalities, and other interested parties that all available information has been provided.
   2. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.

B. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.10 VANDAL RESISTANT DEVICES

A. Where vandal resistant screws or bolts are employed on the project, deliver to the Owner 2 suitable tools for use with each type of fastener used.

B. Proof of delivery of these items to the Owner shall be included in the Operating and Maintenance Manuals.

3.11 PROTECTION

A. Protect work, equipment, fixtures, and materials. At work completion, work must be clean and in original manufacturer's condition.

B. Do not deliver equipment to this project site until progress of construction has reached the stage where equipment is actually needed or until building is closed in enough to protect the equipment from weather. Equipment allowed to stand in the weather shall be rejected, and the contractor is obligated to furnish new equipment of a like kind at no additional cost to the Owner.

3.12 EQUIPMENT BACKBOARDS

A. Backboards: ¾ inch, fire retardant, exterior grade plywood, painted gray, both sides.
   1. Provide minimum of two 4-ft. by 8-ft. sheets of plywood for each location shown.
   2. Provide minimum of two 4-ft. by 4-ft. sheets of plywood for each ESS location.

3.13 SITE MANAGEMENT RESPONSIBILITY

A. The Contractor shall provide an on-site Project Manager as defined in CONTRACTOR’S QUALIFICATIONS portion of this Section.

3.14 DEMOLITION AND RELOCATION

A. The Contractor shall modify, remove, and relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain as directed by the Owner. Materials and items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to the approval of the Owner. The Contractor may substitute new materials and items of like design and quality in lieu of materials and items to be relocated, if approved by the Owner.

B. All items scheduled for relocation and/or reuse shall be inspected by the Contractor and the Owner or his authorized representative. A written report of the condition of each item shall be made and provided to the Consultant. Where items scheduled for relocation and/or reuse are considered unsuitable for reuse, the Contractor shall so notify the Consultant and await reinstallation instructions before proceeding with removal. Items damaged in reinstallation shall be repaired or replaced by the Contractor as directed by the Owner at no additional cost to the Owner or the Consultant.

C. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean, repair, and provide all new materials, fittings, and appurtenances required to complete the relocation and to restore the items to good operative order. All relocations shall be performed by workmen skilled in the work ad in accordance with standard practice of the trades involved.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points as indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or connections into the existing facilities in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific written approval of the Consultant.

3.15 EXISTING SYSTEM TESTING

A. Contractor shall have each low voltage system tested prior to the commencement of construction. Systems shall include all systems that fall under the Division 28 umbrellas, as identified in the Division 2 of the Construction Specifications Institute (CSI) current Master Format7 Test shall include the functionality of all field devices and equipment. Any failures or items found to be functioning not to specification, shall be reported prior to construction. Any items found to be improperly or non-functioning upon the completion of the project, shall be replaced and/or repaired, by the contractor, at no additional cost to the project or the owner.

B. Contractor shall document the location and any ID tag, MAC address, IP address, or bar code of any existing device that is to be removed from its current location. Devices that are to remain, shall be reinstalled in the exact location that they reside in prior to construction, unless noted otherwise.

C. Any individual/firm that will be removing, relocating, reinstalling, or tampering with any devices; shall be licensed by the state and certified by the manufacturer of the system.

D. Contractor shall remove any devices where construction occurs to prevent possible damage to the device. Removal of any devices which support user connection or other systems, shall be coordinated with the owner prior to removal and/or taking offline.

3.16 START-UP RESPONSIBILITY

A. The Contractor shall initiate System operation. The Contractor shall provide competent Start-Up personnel on each consecutive working day until all ESS Systems are functional and ready to start the acceptance test phase. If the Contractor, in the Owner / Architect’s judgment, is not demonstrating progress in solving any technical problems, the Contractor shall supply Manufacturer’s factory technical representation and diagnostic equipment at no cost to the Owner, until resolution of those defined problems. Where appropriate, the Contractor shall bring the Systems on-line in their basic state (i.e., alarm reporting, facility code access control, etc.) It is the responsibility of the Owner to provide the specific database information that will be utilized for initial system programming.

B. Properly ground each piece of electronic equipment prior to applying power. Properly ground all shielded wire shields to the appropriate earth ground at the hub end only, not at the remote or device end.

C. Use a start-up sequence that incrementally brings each portion of the system on-line in a logical order that incorporates checking individual elements before proceeding to subsequent elements

until the entire system is operational. The basic steps should include:

1. Establish ground planes at the equipment rooms and hub end of the systems as specified in Division 26.
2. Disconnect power, connect the first device, reconnect power, and verify operational correctness. Repeat until the entire system is verified and operational.

3.17 PREPARATION FOR ACCEPTANCE (SUBSTANTIAL COMPLETION)

A. All systems, equipment, and devices shall be in full and proper adjustment and operation, and properly labeled and identified.

B. All materials shall be neat, clean and unmarred, and parts securely attached.

C. All extra material as specified shall be delivered and stored at the premises as directed.

D. Test reports of each system and each system's components and As-Built Project Drawings shall be complete and available for inspection and delivery as directed by the Owner.

3.18 SYSTEM ACCEPTANCE REQUIREMENTS

A. Before final acceptance or work, the Contractor shall perform and/or deliver each of the following in the order stated.

B. The Contractor shall deliver three (3) composite "System Operations and Maintenance" manuals in three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain in appropriately tabbed sections:

1. A statement of Guarantee including date of termination and the name and phone number of the persons to be called in the event of equipment failure.
2. A set of Operating procedures for the overall System that includes all required Owner activities, and that allows for the Owner operation of all attributes and facilities of the System.
3. A section for each specific type of equipment containing the vendor manuals, instruction sheets, and any related literature that cam in the original shipping container for that piece of equipment. Include all warranty cards.

C. Testing:

1. The Contractor shall perform all tests required by Division 28 and those submitted as part of this Section.
2. The Contractor shall activate all devices for proper system operation, including supervisory and trouble circuit tests. Similarly, audible alarms will not be activated except on a one-time, coordinated basis, to check the actual sounding devices.
3. A test report for each piece of equipment shall be prepared by the Contractor and submitted to the Owner. This report shall include a complete listing of every device, the date it was tested, by whom and the results. The final test reports shall indicate that every device tested successfully. Failure to completely test and document the tests will result in a delay of final testing and acceptance.

D. As-Built Drawings:

1. After completion of all the tests listed above, and prior to the final acceptance test, The Contractor shall submit the complete As-Built drawings as identified in PART 1 – PROJECT RECORD DRAWINGS.
2. The final As-Built Drawings shall consist on one set of reproducible prints, two (2) sets of Point-to-Point Detail Drawings, Equipment Schedules, and the complete detailed technical data that was shipped by the manufacturer with all installed equipment.

E. Final Acceptance Test: The Final Acceptance Test shall demonstrate the installed and activated System's performance and compliance with System Specifications. However, before this testing can begin the following must have received and reviewed by the Owner.

1. System Operations and Maintenance Manuals
2. System Test Reports
3. As-Built Drawings

3.19 NOTICE OF COMPLETION

A. When the Final System Acceptance Requirements described above including the Final Acceptance Test described above have been satisfactorily completed. The Owner / Architect shall issue a Letter of Completion to the Contractor indicating the date of such completion. The Notice of Completion shall be recorded by the Contractor upon receipt of the Owner / Architect completion letter. This date of record shall be the start of the warranty period.

END OF SECTION

SECTION 28 05 05

ELECTRONIC SAFETY AND SECURITY ALTERATIONS PROJECT PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Inspection and service of existing equipment and materials to remain or be reused.

B. Handling of equipment and materials to be abandoned.

C. Handling of equipment and materials to be removed.

1.2 QUALITY ASSURANCE

A. Coordination with the Contractor prior to the disconnection or shutdown of existing equipment, or to the modification of existing operational systems.

1.3 CONTRACT DRAWINGS

A. There exists the possibility that there are existing conditions and devices which are affected by the work indicated on the drawings and called for in the specifications (project manual) which do not appear on the drawings. It is the Contractors responsibility to visit the site and determine all of the existing conditions and to take these existing conditions into consideration when making and presenting a proposal to as to have a complete proposal.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Material used to upgrade and repair existing equipment shall conform to that specified.

B. Material used to upgrade and repair existing equipment shall not void existing warranties or listings of the equipment to be upgraded or repaired.

C. Material used to upgrade and repair existing equipment shall be new and shall be of the same manufacturer of the existing equipment, shall be acquired through the existing original equipment manufacturer’s approved distribution channels, shall have manufacturer’s warranties for the new material being used, and shall be listed for the use intended.

PART 3 - EXECUTION

3.1 INSPECTION

A. Existing materials and equipment indicated on the drawings or in the specifications to be reused shall be inspected for damaged or missing parts. Notify the Architect/Engineer, in writing, accordingly.

B. If using materials specified or shown on the drawing voids or diminishes the warranty or operation of remaining equipment or systems, the Contractor shall notify the Architect/Engineer, in writing.

C. Verify field measurements and circuiting arrangements.

D. Verify that abandoned wiring and equipment serve only abandoned facilities.

E. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect before disturbing existing installation.

3.2 APPLICATION

A. Existing materials and equipment indicated on the drawings or in the specification to be reused

shall be cleaned and reconditioned, including tightening of feeder and bus bar lugs prior to installation and reuse in the modified system.

B. Material and equipment removed that is not to be salvaged for Owner's use or for reuse on the project shall become the property of the Contractor and shall be removed from the site.

C. Prior to start of construction, Contractor shall walk areas to be renovated with Owner to identify and document items to be salvaged for Owner’s use.

D. Material or equipment salvaged for Owner's use shall be carefully handled and stored where directed by the Owner.

E. Materials and equipment not indicated to be removed or abandoned shall be reconnected to the new system.

F. Clean and repair existing materials and equipment that remain or are to be reused.

3.3 SEQUENCING AND SCHEDULING

A. Coordinate utility service outages with Architect and Owner.

B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

C. Remove and replace existing conduit, wiring, outlets, devices, and appurtenances as occasioned by new or remodeled construction. Re-establish service to devices that may be interrupted by remodeled construction.

D. Disconnect communication systems in walls, floors and ceilings scheduled for removal. When outlets are removed, wire shall be pulled out of the conduit back to the nearest remaining box or cabinet.
1. Remove exposed conduit that has been abandoned.
2. Cap conduit beyond the finish line.

E. Remove equipment, systems, conductors, wiring, raceways, etc. abandoned or not required for existing or new systems. Coordinate with Architect/Owner for salvage by Owner.

F. Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

G. Existing Security System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify the Owner at least 24 hours before partially or completely disabling system. Minimize outage duration.

H. Existing Video Surveillance System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify the Owner at least 24 hours before partially or completely disabling system. Minimize outage duration.

3.4 DEMOLITION AND EXTENSION OF EXISTING SAFETY AND SECURITY WORK

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination as directed by the Owner’s representative unless they are not wanted, then it will be the responsibility of this Contractor to remove such items and properly dispose of them. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon approval of

the Owner's representative substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore them to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner's representative to such items and receive further instructions before removal. Items damaged in repositioning operations are the contractor's responsibility and shall be repaired or replaced by the contractor as approved by the owner's representative, at no additional cost to the Owner.

D. Conduit and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner's representative. Conduit and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Construction Inspector. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities that must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner's representative hereinbefore specified.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove communication devices and equipment serving utilization equipment that has been removed.

G. Repair adjacent construction and finishes damaged during demolition and extension work.

H. Maintain access to existing communication installations that remain active. Modify installation or provide access panel as appropriate.

I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.5 PROTECTION OF THE WORK

A. Provide adequate temporary support and auxiliary structure as necessary to ensure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of work from damage.

C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

D. Repairs, equipment replacements, and corrections to special systems due to damage caused by contractor:
   1. For each special system, a manufacturer certified contractor and certified technicians shall perform corrective measures to each system component that was functional prior to demolition and renovation and found defective or non-functional within 14-days prior to estimated date of substantial completion.
   2. Corrective measures to the special systems to correct components of the special systems found damaged by the contractor shall be completed to the satisfaction of the Owner and Architect prior to acceptance of substantial completion at no additional cost to the Owner.

3.6 TESTING AND CORRECTIVE MEASURES FOR DAMAGE DURING CONSTRUCTION IN EXISTING LOW VOLTAGE SYSTEMS

A. Pre-construction testing of existing low voltage systems:
   1. Provide a complete operational test of the following systems prior to demolition and renovation. Verify operation of each circuit, device, panel, console, distribution equipment, and associated accessories. Test shall be preformed by a contractor and technicians, each certified by the respective manufacturer of the existing special system to perform test, programming, and repairs to the respective manufacturer's system. Testing of the existing system shall include all areas served by the existing system including but not limited to the main campus, remote buildings, and temporary buildings:
      a. Security Access Control System
      b. Video Surveillance System
      c. Fire Alarm and Detection System
   2. Provide a complete written report to the Architect, indicating any deficiencies of the existing system in relation to each component's intended function. Include in the written report evidence of current certification by the respective manufacturer for the contractor and individuals performing the tests. Provide the written report within 14 days of notice to proceed and prior to any demolition or renovation work.

B. Substantial completion testing of existing special systems:
   1. Provide complete operational test of the following systems within 14-days prior to estimated date of substantial completion. Verify operation of each circuit, device, panel, console, distribution equipment, and associated accessories. Test shall be preformed by a contractor and technicians each certified by the respective manufacturer of the existing system to perform test, programming, and repairs to the respective manufacturer's system. Testing of the existing system shall include all areas served by the existing system including but not limited to the main campus, remote buildings, and temporary buildings:
      a. Security Access Control System
      b. Video Surveillance System
      c. Fire Alarm and Detection System
   2. Provide a complete written report to the Architect, indicating any deficiencies of the existing system in relation to each component's intended function. Include in the written report evidence of current certification by the respective manufacturer for the contractor and each individual performing the tests. Provide the written report within 14 days of expected date for substantial completion.

END OF SECTION

SECTION 28 05 07

SHOP DRAWINGS, COORDINATION DRAWINGS & PRODUCT DATA

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prepare submittals as required by Division 1 and as outlined below.

B. Submit product data shop drawings only for the following and for items specifically requested elsewhere in the Contract Drawings and Specifications. Architect / Engineer reserves the right to refuse shop drawings not requested for review and to imply that materials shall be provided as specified without exception.

C. The term submittal, as used herein, refers to all:
1. Shop Drawings
2. Coordination Drawings
3. Product data

D. Submittals shall be prepared and produced for:
1. Distribution as specified
2. Inclusion in the Operating and Maintenance Manual, as specified, in the related section

1.2 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner. Identify details by reference to sheet and detail, schedule, or room numbers shown on Contract Drawings.

B. Show all dimensions of each item of equipment on a single composite Shop Drawing. Do not submit a series of drawings of components.

C. Identify field dimensions; show relation to adjacent or critical features or work or products.

1.3 COORDINATION DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with project name. Identify each element of drawings by reference to sheet number and detail, or room number of contract documents. Minimum drawing scale: 1/4"=1'-0".

B. Prepare coordination drawings to coordinate installations for efficient use of available space, for proper sequence of installation and to resolve conflicts. Coordinate with work specified in other sections and other divisions of the specifications.

C. For each room containing ESS equipment and each rack with ESS equipment, submit plan and elevation drawings. Show:
1. Actual ESS equipment and components to be furnished.
2. NEC working space and NEC access to NEC working space.
3. Relationship to other equipment and components and openings, doors and obstructions
4. Rack location and dimensions

D. Identify field dimensions. Show relation to adjacent or critical features of work or products.

E. Verify location of ESS station devices and other work specified in this Division.
1. Coordinate with drawing details, site conditions and millwork shop drawings prior to installation.
2. Where required for clarification, submit shop drawings prior to rough-in and fabrication.

F. Submit shop drawings in plan, elevation and sections, showing outlets and other devices in casework, cabinetwork and built-in furniture.

1.4 PRODUCT DATA

A. All product options specified shall be indicated on the product data submittal. All options listed on the standard product printed data not clearly identified as not part of the product data submitted shall become part of the Contract and shall be provided.

B. Mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number.

C. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions and required clearances.

D. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

E. Mark up a copy of the specifications for the product to indicate a) acknowledgement of the specification requirement (Comply), or b) acknowledgement that the particular specification requirement does not apply to this specific project (Not Applicable) or, c) acknowledgement that the specification requirement cannot be made or that a variance is being submitted for review to the Architect / Engineer/Owner (Does Not Comply, Explanation:)

1.5 MANUFACTURERS INSTRUCTIONS

A. Submit Manufacturer's instructions for storage, preparation, assembly, installation, start-up and adjusting.

1.6 CONTRACTOR RESPONSIBILITIES

A. Review submittals prior to transmittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Manufacturer's catalog numbers
4. Conformance with requirements of Contract Documents

C. Coordinate submittals with requirements of the work and of the Contract Documents.

D. Notify the Architect / Engineer in writing at time of submission of any deviations in the submittals from requirements of the Contract Documents.

E. Do not fabricate products, or begin work for which submittals are specified, until such submittals have been produced and bear contractor's stamp. Do not fabricate products or begin work scheduled to have submittals reviewed until return of reviewed submittals with Architect / Engineer's acceptance.

F. Contractor's responsibility for errors and omissions in submittals is not relieved whether Architect / Engineer reviews submittals or not.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved whether Architect / Engineer reviews submittals or not, unless Architect / Engineer gives written acceptance of the specific deviations on reviewed documents.

H. Submittals shall show sufficient data to indicate complete compliance with Contract Documents:
1. Proper sizes and capacities
2. That the item will fit in the available space in a manner that will allow proper service
3. Construction methods, materials and finishes

I. Schedule submissions at least 15 days before date reviewed submittals will be needed.

1.7 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Project or in the work of any other Contractor.

B. Number of submittals required:
   1. Shop Drawings and Coordination Drawings: Submit four opaque reproductions.
   2. Product Data: Submit the number of copies the contractor requires, plus those to be retained by the Architect / Engineer.

C. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name, address and telephone number
   4. The number of each Shop Drawing, Project Datum and Sample submitted
   5. Other pertinent data

D. Submittals shall include:
   1. The date of submission
   2. The project title and number
   3. Contract Identification
   4. The names of:
      a. Contractor
      b. Subcontractor
      c. Supplier
      d. Manufacturer
   5. Identification of the product
   6. Field dimensions, clearly identified as such
   7. Relation to adjacent or critical features of the work or materials
   8. Applicable standards, such as ASTM or federal specifications numbers
   9. Identification of deviations from contract documents
   10. Suitable blank space for General Contractor and Architect / Engineer stamps
   11. Contractor's signed and dated Stamp of Approval

E. Coordinate submittals into logical groupings to facilitate interrelation of the several items.
   1. Finishes which involve Architect / Engineer selection of colors, textures or patterns
   2. Associated items requiring correlation for efficient function or for installation

1.8 SUBMITTAL SPECIFICATION INFORMATION

A. Every submittal document shall bear the following information as used in the project manual:
   1. The related specification section number
   2. The exact specification section title

B. Submittals delivered to the Architect / Engineer without the specified information will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.9 RESUBMISSION REQUIREMENTS

A. Make resubmittals under procedures specified for initial submittals.
   1. Indicate that the document or sample is a resubmittal
   2. Identify changes made since previous submittals

B. Indicate any changes which have been made other than those requested by the Architect / Engineer.

1.10 CONTRACTOR'S STAMP OF APPROVAL

A. Contractor shall stamp and sign each document certifying to the review of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

B. Contractor's stamp of approval on any submittal shall constitute a representation to Owner and

Architect / Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the work and the Contract Documents.

C. Do not deliver any submittals to the Architect / Engineer that do not bear the Contractor's stamp of approval and signature.

D. Submittals delivered to the Architect / Engineer without Contractor's stamp of approval and signature will not be processed. The Contractor shall bear the risk of all delays, as if no submittal had been delivered.

1.11 ARCHITECT / ENGINEER REVIEW OF IDENTIFIED SUBMITTALS

A. The Architect / Engineer will:
1. Review identified submittals with reasonable promptness and in accordance with schedule. Specific equipment submittals that may be required to be expedited shall be submitted separately without other submittal items not requiring the same prompt attention.
2. Affix stamp and initials or signature, and indicate requirements for resubmittal or approval of submittal
3. Return submittals to Contractor for distribution or for resubmission

B. Review of submittals will not extend to design data reflected in submittals that is peculiarly within the special expertise of the Contractor or any party dealing directly with the Contractor.

C. Architect / Engineer's review is only for conformance with the design concept of the project and for compliance with the information given in the contract.
1. The review shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
2. The review shall not extend to review of quantities, dimensions, weights or gauges, fabrication processes or coordination with the work of other trades.

D. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 SUBSTITUTIONS

A. Do not make requests for substitution employing the procedures of this Section.

B. The procedure for making a formal request for substitution is specified in Division 01.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION

3.1 SHOP DRAWINGS AND PRODUCT DATA

A. Submittals shall not be combined or bound together with any other material submittal.

B. Submit individually bound shop drawings and product data for the following when specified or provided:
1. Low Voltage Wire
2. Electronic Access Control and Intrusion Detection
3. Electronic Surveillance
4. Fire Detection and Alarm

3.2 COORDINATION DRAWINGS

A. Submit coordination drawings as specified.

END OF SECTION

SECTION 28 05 10

CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contract quality control including workmanship, manufacturer's instructions, mock-ups and demonstrations.

1.2 QUALITY CONTROL PROGRAM

A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, site conditions and workmanship to produce work in accordance with contract documents.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking. Under no conditions shall material or equipment be suspended from structural bridging.

D. Provide finishes to match approved samples; all exposed finishes shall be approved by the Architect / Engineer. Submit color samples as required.

1.4 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence.

B. Should instruction conflict with Contract Documents, request clarification from Architect / Engineer before proceeding.

1.5 MANUFACTURER'S CERTIFICATES

A. When required in individual Specification Sections, submit manufacturer's certificate in duplicate, certifying that products meet or exceed specified requirements.

1.6 MANUFACTURER'S FIELD SERVICES

A. When required in individual Specification Sections, manufacturer shall provide a manufacturer’s qualified personnel to observe:
1. Field conditions.
2. Condition of installation.
3. Quality of workmanship.
4. Start-up of equipment.
5. Testing and adjusting of equipment.

B. Manufacturer’s qualified personnel shall make written report of observations and recommendations to Architect / Engineer.

1.7 MOCK UPS

A. Assemble and erect the specified equipment and products complete, with specified anchorage and support devices, seals and finishes.

B. Do not proceed with any work involving a mock-up, until the related mock up has been approved in writing.

C. Acceptable mock-ups in place shall be retained in the completed work where possible.

D. Perform tests and submit results as specified.

1.8 SCHEDULING OF MOCK-UPS

A. Schedule demonstration and observation of mock-ups, in phases, with Architect / Engineer.
1. Rough-in
2. Finish with all appurtenances in place
3. Demonstrations

PART 2 - PRODUCTS

2.1 REFERENCE APPLICABLE SPECIFICATION SECTIONS

PART 3 - EXECUTION

3.1 ADJUSTMENTS AND MODIFICATIONS

A. Contractor shall provide all adjustments and modifications as requested by the manufacturer's qualified personnel at no additional cost to Owner.

3.2 MOCK-UPS

A. Mock up a typical classroom, science lab of each type, and computer lab with all wiring devices, cover plates, rough-in boxes, conduits, etc. provide all conductors from all wiring devices to above ceiling space to demonstrate conduit routing and conductor fill.

END OF SECTION

SECTION 28 05 50

FIRESTOPS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide firestop as required, and as specified. Refer to Architectural drawings for all fire and smoke rated partitions, walls, floors, etc.

B. Types: Firestop required for the project includes smokestop.

1.2 QUALITY ASSURANCE

A. UL Label: Firestops shall be UL labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Nelson.

B. 3M (Minnesota Mining Manufacturing).

C. Hilti

D. Specified Technologies, Inc.

2.2 MATERIAL AND COMPONENTS

A. General: Except as otherwise indicated, provide firestop manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by the manufacturer, and as required for installation.

2.3 FIRESTOP

A. Conduits: Provide a soft, permanently flexible sealant for 1-1/2 to 2 hour rated fireproofing for steel conduits (up to 4" diameter).

B. Low Voltage Cables, Fiber Optic Cable and Innerduct: Provide Specified Technologies, Inc. EZ-Path single, double, or triple pathways as required.

PART 3 - EXECUTION

3.1 INSTALLATION OF FIRESTOPS

A. General: Install firestops in accordance with the manufacturer's installation instructions and industry practices to ensure that the firestops comply with requirements. Comply with UL and NFPA standards for the installation of firestops.

END OF SECTION

SECTION 28 10 00

ACCESS CONTROL SYSTEM (ACS)

PART 1 - GENERAL

1.1 RELATED WORK

A. The following, in their entirety and as applicable, shall apply to this section. Including any associated drawings.
   1. Conditions of the Contract
   2. Division 1
   3. Division 26
   4. Division 27
   5. Division 28

1.2 WORK INCLUDED

A. The Contractor shall furnish and install a complete microprocessor-based access control system as specified herein. The system shall include, but not be limited to, all control equipment, power supplies, power circuits, signal initiating and signaling devices, conduit, wire, fittings, and all other accessories required to provide a complete and operable system.

B. Security system devices indicated are for reference and coordination purposes only. The installing contractor shall design and provide a complete system, meeting the requirement of specification. The Contractor shall provide all security system devices required for complete system perimeter coverage acceptable to all governing authorities, Architect and Owner.

C. The system shall include security for all access into building, including but not limited to the following:
   1. Control Panels
   2. Power Supplies.
   3. Interconnection of panels.
   4. Installation of new devices.
   5. Card reader.
   6. Magnetic locking hardware
   7. Request to exit devices
   8. Door position sensors
   9. Door Hardware (as specified herein and/or in Division 08, door hardware)
   10. Servers
   11. Clients
   12. Mobile application
   13. Badging Station; including Enrollment Readers, Cameras, Software, and Printers
   14. Lockdown and Lockout Buttons
   15. Audio Intercom Systems
   16. Licensing
   17. Integration
   18. All additional material, hardware, and labor required for a fully functional, turnkey system

D. The contractor shall connect each controller to the ACS Management System.

E. All system programming will be performed by the system installer. The system installer will be required to meet with the Owner, engineer, and system manager to discuss wiring and termination of the system control panels and field devices prior to installation.

F. Licensing: The contractor shall NOT utilize any of the owner’s existing licensing for this scope of work. All licensing shall be provided by the contractor, no exceptions. Including, but not limited to the following:
   1. Portal Licensing
   2. Controller Licensing
   3. Wireless Licensing

4. Video Management Software Integration Licensing

G. Contractor to refer to specification 08 71 00 Door Hardware. Provide and install all hardware specified to be provided by the “Access Control Contractor”, “Security Installer”, “Division 28”, or any variation thereof.

H. The documents issued for this project are conceptual in nature, including but not limited to specifications and drawings. It shall be the responsibility of the approved installer to furnish a complete and functional system, including the items shown on the drawings, in the specifications, and items not designated in either. The installer’s shop drawings and product data submittals shall represent a complete system, and documents accepted do not relieve the installer from being required to provide any materials, equipment, or labor to furnish a complete and functional system as recognized by the Project’s Technology Consultant and the Owner.

I. Contractor shall expand existing system.

1.3 REFERENCES

A. Code of Federal Regulations (CFR).

B. Institute of Electrical and Electronics Engineers (IEEE):
1. 802.3 Ethernet Standards.
2. IEEE 1100 Recommended Practice for Powering and Grounding Electronic Equipment.

C. International Electrotechnical Commission (IEC).

D. International Organization for Standardization (ISO):
1. ISO / IEC 10918 - Information technology -- Digital compression and coding of continuous-tone still images: Requirements and guidelines; JPEG.
2. ISO / IEC 14496-10 - Information Technology - Coding Of Audio-Visual Objects - Part 10: Advanced Video Coding; MPEG-4 Part 10 (ITU H.264).
3. ISO / IEC 23008-2 - High Efficiency Coding and Media Delivery In Heterogeneous Environments - Part 2: High Efficiency Video Coding; MPEG-H Part2 (ITU H.265, HEVC).

E. Federal Communications Commission (FCC):
1. FCC Part 15 – Radio Frequency Device

F. Underwriters Laboratories (UL):
1. UL294 – Access Control Systems Units

G. Electronic Industries Alliance (EIA)
1. RS485 - Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multi-Point Systems

H. Federal Information Processing Standards (FIPS)
1. Advanced Encryption Standard (AES) (FIPS197)
2. FIPS201-2: Open Options DNA Fusion FIPS in conjunction with an E2-SSP-D2-FIPS, NSC-100-FIPS, RSC-2-FIPS and other listed components will provide an access control solution that is fully FIPS 201-2 compliant.
3. Personal Identity Verification (PIV) of Federal Employees and Contractors

I. Homeland Security Presidential Directive 12 (HSPD12)

J. National Fire Protection Association Standards:
1. NFPA 70 - National Electrical Code
2. NFPA 72 - National Fire Alarm Code
3. NFPA 101 - Life Safety Code

K. RoHS compliant

L. SIA AC-01-1996.10 - Access Control - Wiegand

M. Local & State Building Codes

N. Requirements of Local Authorities having Jurisdiction

O. Requirements of American Disabilities Act (Public law 101-336).

P. Texas Accessibility Standards (T.A.S.)

Q. Texas Insurance Code.

1.4 QUALITY ASSURANCE

A. Contractor Qualifications:
1. The installing contractor shall be the authorized representative of the Access Control Manufacturer to sell, install, and service the proposed manufacturer's equipment. The installing contractor shall have represented the security alarm manufacturer's product for at least two years.
2. The installing contractor shall be licensed as required, by the State in which the project is located in, as a security services contractor to design, sell, install, and service security alarm systems.
3. The installing contractor shall provide 24-hour, 365 days per year emergency service with factory trained service technicians.
4. The installing firm shall have personnel on their staff that has been actively engaged in the business of designing, selling, installing, and servicing security alarm systems for at least ten (10) years.
5. All Contractors must submit to the owner prior to starting any work the factory training certificates for all personnel that will be working on the access control system. No person is allowed to work on the system without proper manufacturer's certification.
6. The proposing contractor for this system and the installing contractor of this system shall be of the same organization. Absolutely no subcontracting of any portion of this system by the proposing contractor will be allowed.
7. The proposing/installing contractor of this system must be an authorized dealer / integrator for the project's specified Video Surveillance and the Intrusion Detection systems as well as the system specified in this section.
8. For proper, smooth, and complete integration of the IP security camera, access control, and intrusion detection systems; the proposing/installing contractor of the video surveillance and intrusion detection systems must be the same contractors.
9. Contractor must be a current integrator of solution in the closest major metropolitan area marketplace, have a permanent office located within 75-miles of the project, and be able to include information on current support staff to be able to service this client.

1.5 SUBMITTALS AND CLOSE-OUT

A. Product Data: Within fourteen (14) days of Notice to Proceed, the system installer shall furnish the following in a single consolidated submittal:
1. Permits: The Contractor shall obtain all required permits and provide copies to the Owner / Architect / Engineer.
2. Product Literature: Complete manufacturer's product literature for all system equipment, power supplies, cable, termination components, cable supports, cable labels, field devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner/Designer) and the manufacturer's supporting documentation, demonstrating compatibility with other related products shall be included. The submittal shall have some type of distinguishing marker or pointer to indicated what specific product is to be submitted.
3. Construction Schedule: A time-scaled Construction Schedule indicating general project deadlines and specific dates relating to the installation of the cable distribution system.
4. Specification Compliance: A letter shall be provided stating, by section and subsection,

that the system installer complies with the ENTIRE specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been accepted by the project's technology consultant.

5. Certifications: The contractor shall submit all of the following certifications and the certifications must contain dates which are valid from the date of proposal and not expirer any sooner than 12 months after substantial completion of the project.
   a. Manufacturer's Authorized Dealer/Installer Certification: This certification must be held by the proposing/installing contractor and state that the proposing/installing contractor is and authorized dealer/installer of the system specified within the project specifications. The certification must have been obtained by the office that is within a 75-mile radius of the project's location.
   b. Installer Certification: This certification must be held by at least 25% of the, on-site, staff and be made available at the site if requested by the owner, architect, and/or project's technology consultant.
   c. Licenses: This includes all licenses required by the state in which the work is being performed, the federal government, local authorities having jurisdiction, and any organization in that governs the specific system

B. Shop Drawings: Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed:
   1. Proposed circuit routing and circuit grouping plan prepared by a system registered designer. The designer's certification must be current. Identifiable, separate routing shall be shown for both the station cabling and any backbone trunk cabling.
   2. In addition to the cable routing, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:
      a. Location of all control equipment and remote power sources
      b. Locations of all field devices and outlets
      c. Location of wall penetrations (all penetrations shall be sleeved and contain protective bushings at both ends)
      e. Location of sleeved wall and/or floor pass-thru
      f. Size of sleeve at each location installed
      g. Quantity of cable passing through each sleeve
      h. Conduit routing, size, quantity, and stub-up locations for any floor mounted outlets or outlets installed in casework.
   3. Drawing Compliance: A letter shall be provided stating that the system installer complies with the entire project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been approved by the project's technology consultant.

C. Close-out Procedures: For review and acceptance, furnish an electronic copy of the following documents to the Architect / Engineer. Upon acceptance of the submitted close-out documents, provide four (4) copies on an electronic storage media (CD or USD Flash Drive) Labeled with the project name, date of submission, and the name of the submitting firm. Final copies shall be delivered directly to the project's Technology Consultant. The closeout submittals shall include the following and be packaged in a storable container with the physical storage media and any physical items listed:
   1. Inspection and Test Reports: During the course of the Project, the Contractor shall maintain an adequate inspection system to ensure that the materials supplied, and the work performed, conform to contract requirements. The Contractor shall provide written documentation that indicates that materials acceptance testing was conducted as specified. The Contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.
   2. Provide complete test reports for all cabling and devices that comprise system as outlined in this document.
   3. Include the Name, address and telephone of the authorized factory representative with a

24-hour emergency service number.

4. The manual shall also include Manufacturer's data sheets and installation manuals/instructions for all equipment installed and a list of recommended spare parts.
5. Generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.
6. An up-to-date record ("as-built") set of approved shop drawing prints that have been revised to show each and every change made to the system from the original approved shop drawings.
7. As-built Drawings shall include cable pathways; device locations with correct labeling, control equipment locations, remote power supply locations, cross connect locations, and lightning protection locations. The as-built drawings shall be prepared using AutoCAD 2014 or later.
8. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.
9. A copy of the manufacturer's warranty on the installed system.
10. Any keys to cabinets and/or equipment and special maintenance tools required to repair, maintain, or service the system.
11. Operating and Maintenance Instructions for all devices within the system. These instructions shall reflect any changes made during the course of construction, and shall be provided to the Owner, for their use, in a three-ring binder labeled with the project name and description. (4 copies)
12. Upon completion of the work and at a time designated by the Architect or owner, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all included systems and equipment. Provide a video copy of the training session as well as all sign in and training sign off sheets
13. One (1) 30" x 42" laminated floor plan sheets illustrating device locations, system wiring configuration, and cable designation. Contractor shall provide one complete floor plan sheet at each panel location.

1.6 DEFINITIONS

A. Abbreviations:

1.	ACS	Access Control System
2.	VMS	Video Management System
3.	NVR	Network Video Recorder
4.	IDS	Intrusion Detection System
5.	GUI	Graphical User Interface
6.	IP	Internet Protocol
7.	CR	Card Reader
8.	DS	Door Station
9.	MS	Master Station
10.	PIR	Passive Infrared Sensor
11.	LD	Lockdown
13.	LO	Lockout
14.	MDF	Main Distribution Frame
15.	IDF	Intermediate Distribution Frame

B. Definitions:

1. Access Card: A coded employee card, usually the size of a credit card, recognizable to the access control system and read by a reader to allow access. It can be used for photo identification of the cardholder and for other data collection purposes. Card technologies include magnetic strips, wiegand-effect, proximity (active/passive), barium ferrite, smart/intelligent cards, and NFC enabled applications on mobile devices.
2. Access Control System: An interconnected set of controllers, managing the entrance and exit of people through secured areas.
3. Access Level: The door or combination of doors and/or barriers an individual is authorized to pass through and the times they are permitted.
4. Anti-Pass back (Anti-Tailgating): This feature protects against more than one person using the same card or number. It defines each system card reader and card ID number as IN,

OUT or other. Once a card is granted access to an IN reader, it must be presented to an OUT reader before another IN reader access is granted. Cards will continue to have access to all authorized OTHER readers.

6. Alarm: A signal that indicates a problem.
7. Alarm input: A device that is monitored by the access control panel. An alarm signal will be generated if the device is activated.
8. Badge: Badge is a template or a design for creating a card. DNA Fusion includes a full-featured badge layout utility for designing, creating, and printing badges. Badge design includes magnetic stripe encoding, bar coding, signatures, and so on.
9. Bar Code: A method of encoding information using lines and blank spaces of varying size and thickness to represent alphanumeric characters.
10. Biometrics: A general term for the verification of individuals using unique biological characteristics (i.e. fingerprints, hand geometry, voice analysis, the retinal pattern in the eye).
11. Card and Card Holder: A card is an identity proof of a person and a card holder is a person who holds the card. Multiple cards can be assigned to a single card holder to provide different access.
12. Controller: A microprocessor-based circuit board that manages access to a secured area. The controller receives information that it uses to determine through which doors and at what times cardholders are granted access to secure areas. Based on that information, the controller can lock/unlock doors, sound alarms, and communicate status to a host computer.
13. Card Reader: A device that retrieves information stored on an access card and transmits that information to a controller.
14. Digital Video Recorder: A security system device that records the video from the surveillance cameras (IP and Analog) on a hard disk.
15. Door: A generic term for a securable entry way. In many access control applications, a "door" may be a gate, turnstile, elevator door, or similar device.
17. Duress: Forcing a person to provide access to a secure area against that person's wishes.
18. Input: An electronic sensor on a controller that detects a change of state in a device outside the controller.
19. Integrated lockset: An integrated, intelligent locking solution that typically runs on batteries, but can be externally powered, that contains most of the door components, i.e. reader, door contact, and request to exit in a single, mountable unit.
20. Keypad: An alphanumeric grid which allows a user to enter an identification code. A flat device which has buttons that may be pressed in a sequence to send data to a controller, and which differs from a typewriter-like computer keyboard.
21. Output Relay: A device that changes its state upon receiving a signal from a controller. Typically, the state change prompts an action outside of the controller such as activating or deactivating a device. The auxiliary relays found in access control panels or NODES that control external devices.
22. Shunt Time: The length of time a door open alarm is suppressed (shunted) after a valid card access or free egress request. This time should be just enough to allow a card user to open a door or gate, pass through, and then close it.
23. Time Schedules: Schedules that allow cards to function or not function depending on the time of day. This is used to limit access to the facility. The schedule may include not only time but which days of the week a card is valid.
24. Video Management System: An enterprise-class video management and storage solution

1.7 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.9 PROJECT 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 recommended limits.

1.10 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.11 WARRANTY

A. The ACS furnished by the System Integrator including wiring, software, hardware and third-party products shall be fully warranted for parts, materials and labor for a minimum of 1 year from date of the final acceptance.

B. Manufacturer shall provide a limited 3-year warranty for the product to be free of defects in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:
1. Bosch

B. Requests for substitutions will be considered in accordance with provisions of Division 1. In the absence of direction by Division 1, substitution request must be submitted no less than ten (1) business days from the time of proposal.

2.2 SERVERS AND USER INTERFACE

A. Existing to remain

2.3 ACCESS CONTROL SYSTEM (ACS)

A. General: The ACS is a modular and networked based system providing physical access control security to a Wide Area campus enterprise. The system shall be capable of controlling and integrating multiple security functions including the configuration, management and monitoring of cardholder access, locking hardware units, events, alarms, visitors, and real-time tracking and reporting. The ACS is to be alterable at any time depending on the facility requirements and will allow for easy upgradeability or modification of network processors, controller, interface modules, card data, inputs, outputs, and remote workstations. The ACS shall include, but is not be limited to, the following:
1. Client/Server model operating central server host software modules and client workstation software applications in a multi-user and a multi-tasking environment.
a. The ACS to permit multiple instances of client software applications to run simultaneously on the network. The base system shall include one (1) software application licenses per site with an unlimited number of licenses available subject to connection fees.
2. Partitioning: The system to support security partitioning enabling system administrator to segment the configuration database and group multiple entities within the security partition.
a. Security partitions limit what users can view in the configuration database. Administrators, who have all rights and privileges, can segment a database into multiple security partitions. A user who is given access to a specific partition will only be able to view entities (components) within the partition they have been assigned.
3. Encryption: The system to support encrypted communication between the central server software and client software applications (sever-to-server and client-to-server) using a 128-bit AES encryption algorithm (at a minimum).

a. Communication between the central server host software module and system controllers to be encrypted if supported by the controllers.
b. The ACS client software applications to be password protected with passwords stored in the central server database in an encrypted manner.

4. Distributed Processing: The system is a fully distributed processing application allowing information, including time, date, zones, valid codes, tasks, access levels, and similar data, to be downloaded from the central host station to controller interface devices allowing access-control decisions with or without central host station communication. If communications to a central host station are lost, the controllers will automatically buffer event transactions until communications are restored and events are automatically uploaded to the central host station.
   a. Provide for a higher level of distributed database management at defined perimeter access points such that no single point of failure will allow more than two access points to fail, or affect more than two access points at perimeter points system wide.
5. Single Data Base: The system to support a single database for access control site setup, credential and identity file creation, alarm and control setup, and system user operation and command functions.
6. System Access Management: The system to allow operators through password authentication the ability to make access granted or denied decisions, define access levels, time zones, holidays, assign cardholders, access groups, develop tasks, and generally manage access control, alarm monitoring and response activities system wide from a single login. Operator and user privileges are managed by a system administrator allowing for different levels of system access and system control. Authorization management is fully Owner definable.
7. Cardholder Management: The system to include a cardholder management system integrated within the access control system. This cardholder management functionality allows the enrollment of cardholders into the database, and import / export of employee data.
8. Access Groups and Access Levels: The system to provide adequate access groups and access level assignment capability to meet Owner requirements for the specified project. If required, software application can be expandable to support unlimited access groups and access levels.
9. Alarm Monitoring: The system is able to monitor, report, and provide information about the time and location of alarms, along with their priority.
10. Event Monitoring: The system is able to monitor, report, and archive network access control activity.
11. Transaction Logs: The system to support an unlimited number of logs and historical transactions (events and alarms) with the maximum allowed being limited by the amount of hard disk space available.
12. System Monitoring: The system to have ability to report on the integrity of all network assigned devices, circuits and communications and provide a diagnostics screen showing field level communications system wide
13. Lock/Unlock Commands: The system to allow an operator to manually lock and unlock doors overriding scheduled access control restrictions and configurations if necessary.
14. Hardware Interface: The system to integrate with and control specified electrified hardware, signaling and monitoring devices.
15. Report Generator: The system to have the ability to generate and output reports with any and all combinations of system fields and data including, but not limited to: by cardholder, by door, by site, by time, by groups of doors and by cardholder field. Any and all combinations of fields must be available for reporting. The report feature to allow exporting of generated reports over a network connection or by remote printing.
16. Multi-User/Web Based Network Capabilities: The system to support multiple operator workstations via local area network/wide area network (LAN/WAN), the Internet, or VPN. The system to be capable of supporting minimum of concurrent users/clients with software expansions to an unlimited number of workstations based on the Owners network requirements.
17. Systems Integration: The system to have the ability to be fully and seamlessly integrated with existing or specified IDS and VMS.

B. Open Architecture: The access control system infrastructure will be based on an open architecture design capable of supporting multiple access control hardware manufacturers and integrate with multiple non-proprietary network processors, controllers, interface modules, integrated locking hardware, remote card readers, keypads and display terminals, and other third party applications.

C. Open Protocol: The ACS manufacturer to provide non-proprietary, open protocol hardware for the system control processors and associated device sub-controllers. Systems utilizing a single manufacturer solution that encompasses combined proprietary software and integrated electronic hardware combinations are not acceptable. In addition, integrated electronic locking hardware requiring a processor or sub-controller module upgrade, or extensive access control firmware upgrades to accommodate integrating with an alternate software package, will not be considered.

D. Network Support: Communication network connecting the central server host software modules, client workstation software applications, and hardware controllers to be designed to support all of the following:
1. LAN/Ethernet enterprise ring topology and localized star topology based on TCP/IP.
2. Direct-connected RS-232 and RS-485 communication cabling.
3. Dial-up modem connection using a standard dial-up telephone line.

E. Provide local communication port at each panel for local configuration of system with laptop.

F. Locate all main control panels in MDF and IDF rooms of each building.

G. Provide 120v at all controller and power supply locations.

H. Provide and transfer all required licensing to the owner.

I. Provide local communication port at each panel for local configuration of system with laptop.

J. Provide and install all software and/or hardwire connections required to connect the system to IDS and VMS.

K. Integrated Elevator Destination Dispatch Control Solutions
1. The ACS shall provide means of integration with the following elevator systems destination dispatch control solution. Integration shall be by software or input/output connection (software, if available between the specified ASC and Elevator System):
   a. Otis
   b. Krone
   c. Thyssen-Krupp
2. The destination dispatch control solution shall provide the following functions:
   a. Provide card reader security within the elevator(s) as required.
   b. Provide card reader security at the Destination Dispatch kiosk(s), as required.
   c. Allow Default Floor call registration upon card swipe.
   d. Allow for card flags such as VIP and ADA from a card swipe
   e. Enforce elevator access levels

L. Integrated Video Management Systems: The ACS shall support integration of DVR and/or NVRs from the following manufacturer. Integration to be completed by the system installer:
1. Video Insight

2.4 ACCESS CONTROL PANEL HARDWARE

A. Expand existing hardware

2.5 FIELD DEVICES

A. General: Coordinate with door hardware and access control schedule as to whether each access control portal is wireless or directly connected to a control panel. Provide all Controllers, Sub-Controllers, and licensing as required to connect all card reader locations shown on plan.

B. Card Readers: Provide card readers as shown on the floor plans, access control schedule, and

access control details.

C. Credentials: Coordinate Facility Code, External Start Number, and Internal Start number with the Owner prior to procuring credentials.

D. Miscellaneous Devices: Provide the following devices as designated per the project floor plans, access control schedules, and access control details:
1. DP/DT Door Position Sensors (Door Contacts)
2. PIR Motion Request to Exit Sensor
3. Lockdown Buttons
4. Door Release Buttons
5. Video Intercom Door Stations
6. Video Intercom Master Stations

2.6 WIRING

A. Ethernet cabling shall be provided by the Structured Cabling System Installer. In the event that there is not ACS installer on the project, cabling shall be provided and installed by the Access Control System Integrator and shall comply with the Division 27 Structured Cabling specification.

B. Conventional access control cable shall be a jacketed composite cable. All non-network cabling shall be orange. The minimum conductor requirement shall be as follows:
1. Standard
   a. Lock Power: 4-conductor, 18AWG, shielded
   b. Card Reader: 6-conductor, 22AWG, OA shielded
   c. Door Contact: 2-conductor, 22AWG, shielded
   d. Request to Exit/Spare: 4-conductor, 22AWG, shielded
2. Extended Distance
   a. Lock Power: 4-conductor, 16AWG, shielded
   b. Card Reader: 6-conductor, 18AWG, OA shielded
   c. Door Contact: 2-conductor, 18AWG, shielded
   d. Request to Exit/Spare: 4-conductor, 18AWG, shielded

C. Wire scheme and conductor quantity shall be as required by the manufacture’s specifications. Contractor to provide and install shielded cable as required.

D. All 120v Power shall be furnished by the Division 26 contractor. In the event that a division 26 contractor is not contracted for the project, the system installing contractor shall contract a licensed electrical firm to provide and install all materials required to furnish a complete and operational system.

E. All Security Conduit as required for a complete installation of this system shall be furnished by the division 26 contractor as part of their scope of work. In the event that a division 26 contractor is not contracted for the project, the system installing contractor shall provide and install all conduit required.

F. Coordination with the Division 26 contractor is the responsibility of the Security Contractor to ensure all conduit is in place for a complete installation.

G. All systems shall be connected to a dedicated circuit and on an emergency power source if available.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All wiring shall be in accordance with the National Electrical Code, Local Codes, and article 760 of NFPA Standard 70. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.

B. All wire shall be UL Listed CL2 for limited energy (300V) applications and shall be installed in conduit. Limited energy MPP wire may be run open in return air ceiling plenums provided such wire is UL Listed for such applications and is of the low smoke producing fluorocarbon type and complies with NEC Article 760 if so, approved by the local authority having jurisdiction.

C. No AC wiring or any other wiring shall be run in the same conduit as security alarm wiring.

D. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per NEC.

E. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings.

F. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed or subject to damage.

G. All vertical wiring and all main trunk/riser wiring shall be installed in a complete raceway/conduit system. All riser boxes shall be adequately sized for the number of conductors transversing the respective box as well as the number of terminations required.

H. Network Connection Cable: Provide a 4 pair Category 6 data cable from the Master Control Panel to the MDF network rack. Category 6 cable shall be purple in color.

I. All plenum wiring is to be installed parallel and perpendicular to the building structure. Install wiring tight up against structure for protection. Cable shall be bundled on a maximum of 2'-6" and secured to the structure at a maximum of 5' on center. Bundling and support shall be with plenum rated cable ties.

J. Contractor is required to provide all mapping and software configuration required to operate system as per manufacturer’s recommendations.

3.2 CABLE PATHWAYS

A. Cable Support:
1. All wire not installed inside conduit or a designated cable tray system shall be installed in a dedicated cable support system for the entire run of each cable. Including, but not limited to service loops.
   a. Approved Cable Support Product:
      1) Panduit
      2) Arlington
      3) Caddy
      4) Support system shall be sized appropriately for the number of wires being installed. Reference the manufacturer’s specifications for the suggested maximum cables per support size.
2. The approved cable support system shall be attached directly to the building steel at a serviceable height. In the event that the building steel is not 5’ of the finished ceiling, the contractor shall provide a dedicated threaded rod extending within 5’ of the finished ceiling and mount the J-MOD™ support hook to the treaded rod.
3. J-MOD™ cable support shall be installed at a maximum of 5’ on center.
4. All cable installed shall be attached to the J-MOD™ support system with plenum rated Velcro and a plenum rated Velcro tie shall be installed between each J-MOD™ cable support to keep wires neatly bundled throughout the entire run. Tie wraps will only be allowed to be used inside the control panels as required to manage the wires within each type of panel.
5. Absolutely no cable, not installed in conduit, will be allowed to be attached directly to the building’s steel or supported in any other method than that stated above.
6. It is the responsibility of the installing contractor to coordinate with all other trades on the project to ensure that the pathway of this system does not interfere with the installation of the other trades and to prevent the installed product of other trades from putting strain on the installed wiring.

B. Conduit / Raceway:
   1. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per NEC.
   2. Conduit and raceway system shall be installed as specified under the general electrical section of the specifications, and per NEC.
   3. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings.
   4. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed or subject to damage.
   5. All conduit ends shall have a protective bushing to prevent cable damage. Bushings must be installed prior to installing cable. Cutting bushing to install around installed cables will not be accepted.

3.3 SYSTEM ZONING AND PARTITIONING

A. The system shall employ intelligent initiating devices and interface devices capable of being recognized and enunciated at the main system keypad and devices partition keypad.

3.4 TESTING

A. Submit a written test report from an authorized representative of the equipment manufacturer that the system has been 100% tested and approved. Final test shall be witnessed by Owner and the project’s Technology Consultant and performed by the equipment supplier. Final test report must be received and acknowledged by the Owner prior to substantial completion.

B. Provide instruction as to proper use and operation of system, for the Owner's designated personnel.

3.5 WARRANTY

A. Entire system shall be warranted against defects in materials and workmanship for a period of one (1) year from the date of substantial completion.

3.6 SOFTWARE

A. Provide two electronic copies of the final programming and program software to the Owner’s Security Supervisor after final approval.

SECTION 28 16 01

INTRUSION DETECTION SYSTEM

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1- GENERAL

1.1 RELATED WORK

A. 26 05 00 – Grounding and Bonding

B. 26 05 29 – Electrical Hangers and Supports

C. 26 05 33 – Raceway and Boxes

1.2 WORK INCLUDED

A. The Contractor shall furnish and install a complete microprocessor based Intrusion Detection System (IDS) as specified herein. The IDS shall include, but not be limited to, all control equipment, power supplies, power circuits, signal initiating and signaling devices, conduit, wire, fittings, and all other accessories required to provide a complete and operable system.

B. IDS devices indicated are for reference and coordination purposes only. The installing contractor shall design and provide a complete system, meeting the requirement of specification. The Contractor shall provide all security system devices required for complete system perimeter coverage acceptable to all governing authorities, Architect and Owner.

C. The IDS shall include security for all access points into the building(s), including but not limited to doors, roof hatches, windows and interior space motion detection.
1. The IDF shall be the product of a single manufacturer.
2. Tag all conductors or cables at each end.
3. Installation of IDS panels.
4. Interconnection of IDS panels.
5. Installation of new IDS devices.
6. Full coverage of all windows, doors, roof hatches.
7. Preconstruction meeting with Owner's personnel, installing technician and project superintendent.

D. The contractor shall connect this location to the district monitoring station as designated by the owner.

E. Contractor shall integrate all Emergency Eyewash systems into the IDS. Provide cabling connecting both systems. Coordinate with Emergency Eyewash systems contractor.

F. Contractor shall expand existing system..

1.3 CODES AND STANDARDS
The system shall comply with the applicable Codes and Standards as follows:

A. National Electric Code, Article 760.

B. National Fire Alarm Code (NFPA 72).

C. Life Safety Code (NFPA 101)

D. Administrative Council for Terminal Attachments (ACTA):
1. ANSI/TIA-968-A-2002 Technical Requirements for Connection of Terminal Equipment to the Telephone Network.

E. American National Standards Institute(ANSI):
1. ANSI C63.4 Methods of Measurement of Radio-Noise Emissions from Low-Voltage

Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

F. California State Fire Marshal (CSFM):
1. Title 19, California Code of Regulations, Building Material Listing Program (BML).

G. Federal Communications Commission (FCC):
1. Title 47 C.F.R. Part 15; Class B – Radiated and Conducted Emissions.
2. Title 47 C.F.R. Part 68; rules governing the connection of Terminal Equipment (TE) to the Public Switched Telephone Network(PSTN).

H. The National Institute of Standards and Technology of the United States of America (NIST):
1. Federal Information Processing Standards Publications 197 (FIPS 197) –Advanced Encryption Standard (AES).

I. International Organization For Standardization (ISO):
1. 9001 - Quality System.

J. Underwriters Laboratories, Inc. (UL):
1. UL 50 - Enclosures for Electrical Equipment.
2. UL 294 – Access Control System Units.
3. UL 365 - Police Station Connected Burglar Alarm Units and Systems.
4. UL 609 - Local Burglar Alarm Units and Systems.
5. UL 864 - Control Units System for Fire-Protective Signaling System.
6. UL 985 - Household Fire Warning System Units.
7. UL 1023 - Household Burglar Alarm System Units.
8. UL 1076 – Proprietary Burglar Alarm Units and Systems
9. UL 1610 - Central Station Burglar-Alarm Units.
10. UL 60950-1 - Information Technology Equipment - Safety.
11. UL 636 – Hold up alarms

K. Local & State Building Codes

L. Requirements of Local Authorities having Jurisdiction

M. Requirements of American Disabilities Act (Public law 101-336).

N. Texas Accessibility Standards (TAS)

O. State Fire Marshall.

P. Texas Insurance Code.

1.4 QUALITY ASSURANCE

A. Contractor Qualifications:
1. The installing contractor shall be the authorized representative of the IDS authorized/certified to sell, install, and service the proposed manufacturer's equipment. The installing contractor shall have represented the IDS manufacturer's product for at least five (5) years.
2. The installing contractor shall be certified to install and setup the IDS software with Security Engine and Access Engine Modules attached.
3. The installing contractor shall be licensed by the State of Texas as a security services contractor to design, sell, install, and service security alarm systems and access control system.
4. The installing contractor shall provide 24 hour, 365 day per year emergency service with factory trained service technicians.
5. The installing contractor shall have personnel on their staff that has been actively engaged in the business of designing, selling, installing, and servicing security alarm systems for at least ten (10) years.
6. All Contractors must submit to the owner prior to starting any work the factory training certificates for all personnel that will be working on the specified IDS. No person is allowed to work on the IDS without proper manufacturer's certification.

1.5 SUBMITTALS

A. The installing contractor and/or equipment supplier shall provide complete and detailed shop drawings and include:
   1. Control panel wiring and interconnection schematics.
   2. Complete point to point wiring diagrams.
   3. Riser diagrams.
   4. Complete floor plan drawings locating all system devices.
   5. Factory data sheets on each piece of equipment proposed.
   6. Detailed system operational description. Any specification differences and deviations shall be clearly noted and marked.
   7. Complete system bill of material.
   8. Line by line specification review stating compliance or deviation.

B. All submittal data will be in bound form with Contractor's name, supplier's name, project name, and state security license number adequately identified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND INSTALLERS

A. Acceptable Manufacturer: Bosch Security Systems, Inc.; 130 Perinton Parkway; Fairport, NY 14450. ASD. Toll Free Tel: 800-289-0096. Tel: 585-223-4060. Email: request info (presales.support@us.bosch.com). Web: www.boschsecurity.us.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of section 01600.

2.2 CONTROL COMMUNICATOR (Panel)

A. The IDS control panel shall be Bosch Security Systems, Inc., model # B9512G comprising a fully integrated intrusion and access control system. The control panel shall support the following:
   1. The IDS system is capable of being utilized as a Intrusion system per code. Fully integrated intrusion and access control functions allow users to interface with 1 system instead of 2
   2. Telephone Line Module Interface with programmable options for signaling and supervision.
   3. Conettix IP based communication option provides high-speed, secure alarm transport and control.
   4. 32 programmable areas with perimeter and interior partitioning.
   5. 8 on-board, class B hardwired points with expansion capability for a total of at minimum 500 wired or wireless points.
   6. Compatibility with touch-screen color LCD, vacuum fluorescent, ATM style LCD or LED style Alarm Command Centers.
   7. Local or remote programming, test, and diagnostic capability via a computer running the Remote Programming Software (RPS).
   8. The system shall support the use of an Apple iOS device for control. Functions to include arming, disarming, control of outputs, lock, unlock, cycle and secure access doors.
   9. Integrated real time clock, calendar, test timer and programmable scheduling capability for relay control and automatic execution of system functions based on a time / event.
   10. Provide 1.4 amps of power for standby operation and 2 amps of alarm power, both rated at 12 VDC.
   11. 2 wet-contact relay outputs and 1 Auxiliary wet-contact relay output with expansion capability for up to an additional 128 dry-contact relay outputs.
   12. Integrated battery charger with reverse hook up protection, battery supervision and battery deep discharge protection.
   13. Supervision of peripheral devices and communications interface(s).

B. Programmable features shall include:
   1. Independently control zones through an independent zone control keypad.
   2. Two telephone number dial up for primary and secondary remote receivers.
   3. Automatic test reports.
   4. Selective zone shunting.
   5. Custom text on the associated command centers.

C. Zone Expansion - Expanded to 500 (8 on-board, 492 off-board) individually annunciated points of protection through the addition of a two-wire multiplex zone expansion system (ZONEX). Points of protection are annunciated with custom text at the B915 Command Center and they can be reported to a Radionics D6600Receiver.

D. User Pass Codes – nine hundred ninety-nine (999) user pass codes shall be available to identify the user when arming/disarming the system.

E. Protective Circuits shall consist of zones designed for fire and/or panic (holdup, duress, or emergency) and/or burglary and/or supervisory. Each zone represents a protective circuit and shall accommodate normally opened and closed devices with end-of-line resistor supervision. Each of the 500 points are programmable as to whether they are controlled versus 24 hours; interior versus perimeter; instant versus delayed; silent versus audible (and if audible, pulsed or steady); and local or reporting.
   1. Additional programmable parameters for each point include the ability to suppress trouble or restoral reports, designate it as a priority zone (system cannot be armed if this point is off-normal), report two separate telephone numbers and provide for automatic shunting of points from the system in the event that the detection device malfunctions and creates numerous false alarms.
   2. Each POPIT shall accommodate normally opened and normally closed devices with end-of-line resistor supervisor.
   3. Minimum total points, 500.

F. Entry/exit delays shall be independently programmable from 10 to 150 seconds. A pre-warn audible shall be coincident with the entry delay.

G. Programming of all system functions shall be achievable at system site or remotely via the use of the dial-up telephone network. Minimum programmable functions shall include:
   1. User pass codes, entry/exit delay times, master zone personality, day/date/time, telephone numbers, point of protection text labels, and bell time.
   2. A programmable system pass code shall be used to prevent unauthorized remote programming attempts.
   3. Remote programming capability shall be automatic or require user enabling at the discretion of the user.

H. Remote control via the use of the dial-up telephone and owner's local area network shall include:
   1. System arming.
   2. Reset of audible signals.
   3. Activation/deactivation of relay contacts.
   4. Interrogation of battery.
   5. Zone and armed status.
   6. Enable/disable of reporting functions and removing reporting devices for servicing while the remainder of the system is operative.

I. Recognitions shall include: UL for central station fire and/or burglary, local burglary and/or fire; FM for fire, California Fire Marshal for fire; and NYBSA for fire.

J. Miscellaneous built-in features shall include:
   1. Real-time clock.
   2. Interrogator.
   3. Auto-answer modem.
   4. Phone line monitor.
   5. Loop start/ground start telephone interface.
   6. Auto bell test.
   7. Lug-in terminal strips, and user controlled zone bypass.

K. Command centers shall be microprocessor-based
1. 16 character illuminated alpha-numeric display.
2. Burglary and fire sounders.
3. Backlight 15-key touchpad.
4. Pre-warn tone.
5. The arming station shall have the ability to annunciate the English language format via the 16 character alphanumeric display by the following:
   a. Master zone (alarm, service, faulted, and function), POPIT (alarm, service, faulted, missing, extra, function, and location), arm/disarm status (system diagnostics, time/day/date, and user prompts).
6. Additional features shall include local system test, sensor reset, panic and/or medical and/or duress alarm initiation, independent master zone by-pass with automatic restoration to normal status to next system arming, perimeter watch mode, user changeable pass codes, remote programming initiation, and system/monitoring service test.
7. Radionics model B915, and shall be functional at each of the locations shown on the floor plans.
8. Non-school oriented buildings will use Radionics Model B942 Touch Screen Keypads

L. Modules and Accessories
1. POPEX Module (Zone Expansion B299)
2. B8103 Main Panel Enclosure & D101 Lock set- one required for the main panel and one for each quadrant of the project receiving a B299.
3. D9002-5 6 location 3 hole Mounting plate- adapter used for hanging modules in all expansion panels.
4. B430 Telephone Line Interface
5. B308 Octo-Relay module - provides eight form "C" dry contact relay outputs for a variety of programmable responses to alarm, trouble and other system conditions.
6. Auxiliary power supplies as required for powering of motion detectors, Altronix Power Supply (Part # SMP10PM12P8) - one required for each quadrant of the project receiving a B299.

2.3 FIELD DEVICES

A. Ceiling mounted 360 Degree, infrared sensors / microwave motion sensors. Model DS 9370
1. Bracket for direct mounting to standard 3-1/2" and 4" electrical back boxes.
2. All units must be adjusted/masked to reduce false signals for the covered area.
3. Contractor to provide a dedicated POPIT for each motion detector on the project.

B. Ceiling mounted 200ft Long Range infrared sensor. Model DS794Z
1. Bracket for direct mounting to standard 3-1/2” and 4” electrical back boxes.
2. All units must be adjusted/masked to reduce false signals for the covered area.
3. Contractor to provide a dedicated POPIT for each motion detector on the project

C. Wall mounted, high performance, Tri Tech PIR/Microwave sensor, Model ISC-CDL1-W15G
1. Bracket for direct mounting to standard 3-1/2” and 4” electrical back boxes.
2. All units to have areas of coverage, which would cause false alarm signals to be generated, masked out and adjusted to reduce false signals.
3. Provide model correct protective wire cage in gymnasiums.
4. Contractor to provide a dedicated POPIT for each motion detector on the project.

D. Magnetic Door / Hatch / Overhead Contacts
1. Where exposed contacts are used they shall be heavy duty switches protected by die cast aluminum housing and the leads shall be encased in steel armor jacket. The leads must pass through the back box by the correct size twin screw cable clamp connector.
2. Magnetic Door / Hatch contacts shall be model Sentrol 2505A-L contact
3. Overhead Roll up contacts shall be model Ademco 958 contact
4. Contractor to provide a dedicated POPIT for each entry door, set of doors, roof hatch or rollup door on the project.

E. Glass Break Detector
1. Bracket for direct mounting to standard 3-1/2" and 4" electrical back boxes.
2. Provide model correct protective wire cage in gymnasiums.
3. Model GE Solution 2000 or GE Model 5812-RND
4. Contractor to Provide dedicated POPIT for each room of glass break detectors on the project.

F. Sirens
1. Shall be installed on Wall / Ceiling within 50 foot of every keypad location.
2. Wired directly to corresponding relay module and not the main control panel.
3. Model SSX-52 Amseco or compatible Siren shall be used.

2.4 WIRING

A. All wiring shall be by the manufactures (Bosch/Radionics) specifications. All cable shall be shielded as required.

B. Each area of a building shall provide its own Popex Module(s), Power supply(ies) and enclosure(s) in that areas IDF. All areas considered should be at minimum 500ft from the main panel or as otherwise instructed by owner.

C. All 120v Power shall be furnished by the contractor.

D. All Security system conduits as show on the drawings shall be furnished by the contractor as part of their scope of work.

E. Coordination with the electrical contractor is the responsibility of the Security Contractor to ensure all conduit is in place for a complete installation.

F. All systems shall be connected to an emergency power source as available.

G. Color code of all security intrusion detection system and access control wiring shall be orange in color.

H. Approved Products:
1. 18/2 unshielded:
   a. Belden #6300UE0071000
   b. Tappan Wire & Cable, Inc. #P40020.122
2. 18/4 unshielded:
   a. Belden #6302UE0071000
   b. Tappan Wire & Cable, Inc. #P41387.28
3. 18/6 unshielded:
   a. Belden #6304UE0071000
   b. Tappan Wire & Cable, Inc.

PART 3- EXECUTION

3.1 INSTALLATION

A. All wiring shall be in accordance with the National Electrical Code, Local Codes, and article 760 of NFPA Standard 70. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings

B. All wire shall be UL Listed CL2 for limited energy (300V) applications and shall be installed in conduit. Limited energy MPP wire maybe run open in return air ceiling plenums provided such wire is UL Listed for such applications and is of the low smoke producing fluorocarbon type and complies with NEC Article760 if so approved by the local authority having jurisdiction.

C. No AC wiring or any other wiring shall be run in the same conduit as security alarm wiring.

D. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" not to exceed 40% per NEC.

E. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings.

F. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations such as inside walls, all mechanical / electrical rooms, or other areas where wiring might be exposed or subject to Damage.

G. All vertical wiring and all main trunk / riser wiring shall be installed in a complete raceway / conduit system. All riser boxes shall be adequately sized for the number of conductors transversing the respective box as well as the number of terminations required.

H. Provide a Green Systimax Category 6 telephone cable from the Master Control Panel to the Telephone Equipment room.

I. Two 18-4 wires will be run from the panel to the prior designated future portable connection location and labeled in plain English on both ends. These spares are to be left above the ceiling.

J. Each set of glassbreaks that protect one room are to be connected through one POPIT module for point identification of that room.

K. Magnetic door contacts protecting separate hallways or entries are to be connected into separate POPIT modules for separate identification.

L. Provide and install (1) dedicated POPIT for each device installed on the project including but, not limited to glass break detectors.

M. All POPIT Modules shall be installed inside a 4”x4” junction box with a cover to be mounted on the wall nearest to the device the POPIT Module is associated with. All boxes shall be labeled with the appropriate corresponding point contained within.

N. Integrate the security system to the remote monitoring station. Provide all hardware and cabling as required. Coordinate with Owner for approved remote monitoring service.

O. All POPIT modules on project shall be mounted above drop ceiling in easily accessible area.

P. All keypads, sirens and POPEX modules shall have dedicated homeruns from each device to the master control panel. Do not daisy chain keypads or sirens. Chaining of modules is permitted if location serves multiple areas of coverage.

Q. All POPIT modules and power supplies are required to be located on as-built drawings delivered to owner at substantial completion of project.

R. Contractor shall install communication wire from provided exterior connection at freezer/cooler control panels to burglar alarm via POPIT module interface to notify panel should freezer/cooler encounter high temperature condition. Coordinate programming and testing of module with owner.

S. All POPEX modules and power supplies shall be installed in IDF closets for that area of coverage with easy accessibility and a dedicated SDI2 homerun to the master control panel not to exceed 500ft.

T. All device power runs shall be fused and clearly labeled in plain English at each main power source.

U. All Eyewash stations and Lockdown buttons shall have a dedicated POPIT module interface per device on the project.

3.2 CABLE PATHWAYS

A. Cable Support:
1. All wire not installed inside conduit or a designated cable tray system shall be installed in a dedicated cable support system for the entire run of each cable. Including, but not limited to service loops.

a. Approved Cable SupportManufacturer: Panduit Corporation Erico Caddy B-Line

2. Supports shall be sized appropriately for the number of wires being supported. Reference the manufacturer's specifications for the suggested maximum cables per support size.
3. The approved cable support system shall be attached directly to the building steel at a serviceable height. In the event that the building steel is not 5' of the finished ceiling, the contractor shall provide a dedicated threaded rod extending within 5' of the finished ceiling and mount the cable support hook to the treaded rod.
4. J-MOD™ cable support shall be installed at a maximum of 5' on center.
5. All cable installed shall be attached to the cable support system with plenum rated Velcro and a plenum rated Velcro tie shall be installed between each cable support, to keep wires neatly bundled throughout the entire run. Tie wraps will only be allowed to be used inside the control panels as required to manage the wires within each type of panel.
6. ABSOLUTELY NO CABLE, NOT INSTALLED IN CONDUIT, WILL BE ALLOWED TO BE ATTACHED DIRECTLY TO THE BUILDING'S STEEL OR SUPPORTED IN ANY OTHER METHOD THAN THAT STATED ABOVE.
7. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO COORDINATE WITH ALL OTHER TRADES ON THE PROJECT TO INSURE THAT THEPATHWAY OF THIS SYSTEM DOES NOT INTERFERE WITH THE INSTALLATION OF THE OTHER TRADES AND TO PREVENT THE INSTALLED PRODUCT OF OTHER TRADES FROM PUTTING STRAIN ON THE INSTALLED WIRING.

B. Conduit / Raceway:

1. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per NEC.
2. Conduit and raceway system shall be installed as specified under the general electrical section of the specifications, and per NEC.
3. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings.
4. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed or subject to damage.

3.3 SYSTEM OPERATION

A. When an alarm condition is detected by any of the alarm initiating devices, the following functions shall occur:

1. The system keypad's interior audible device shall sound until silenced by using proper security code or after system time out.
2. A custom system alarm message shall be displayed on the LCD display. This display will show the alarm device location in plain English. Location and partition custom messages shall be field programmable.
3. The remote signaling tie connection shall be activated at the Owner's approved central security monitoring location and/or other Owner designated location.
4. Printer shall provide printed copy of events recorded in logger. Install adjacent to security panel.

3.4 SYSTEM ZONING AND PARTITIONING

A. The system shall employ intelligent initiating devices and interface devices capable of being recognized and enunciated at the main system keypad and devices partition keypad.

B. All zoning/device locations shall be field programmable.

C. Input control zones shall be coordinated with the owner prior to final programming:

3.5 TESTING

A. Submit a written test report from an authorized representative of the equipment manufacturer that the system has been 100% tested and approved. Final test shall be witnessed by Owner, Engineer, Electrical Contractor and performed by the equipment supplier. Final test report must be received and acknowledged by the Owner prior to substantial completion.

B. Provide instruction as to proper use and operation of system, for the Owner's designated personnel.

3.6 WARRANTY

A. Entire system shall be warranted against defects in materials and workmanship for a period of one (1) year from the date of substantial completion.

3.7 SOFTWARE

A. Provide two electronic copies of the final programming and program software to the Owner’s Police Technology Foreman after final approval.

END OF SECTION

SECTION 28 20 00

VIDEO SURVEILLANCE SYSTEM (VSS)

PART 1 GENERAL

1.1 RELATED WORK

A. The following, in their entirety and as applicable, shall apply to this section. Including any associated drawings.
   1. Conditions of the Contract
   2. Division 1
   3. Division 26
   4. Division 27
   5. Division 28

1.2 GENERAL PRODUCT REQUIREMENTS

A. The Contractor shall expand the existing VSS to include new devices as shown on the drawings. Expansion of the system shall include, but not be limited to the following:
   1. Licenses
   2. Cameras
   3. Programming
   4. Accessories and Miscellaneous equipment and materials as required for a complete solution.

B. System installation shall be in compliance with all codes, standards, best practices, and manufacturer instruction.

1.3 SECTION INCLUDES

A. IP security cameras.

B. VMS software licenses.

C. Accessory products.

1.4 REFERENCES

A. Code of Federal Regulations (CFR).

B. Institute of Electrical and Electronics Engineers (IEEE):
   1. 802.3 Ethernet Standards.

C. International Electrotechnical Commission (IEC).

D. International Organization for Standardization (ISO):
   1. ISO / IEC 10918 - Information technology -- Digital compression and coding of continuous-tone still images: Requirements and guidelines; JPEG.
   2. ISO / IEC 14496-10 - Information Technology - Coding Of Audio-Visual Objects - Part 10: Advanced Video Coding; MPEG-4 Part 10 (ITU H.264).
   3. ISO / IEC 23008-2 - High Efficiency Coding and Media Delivery In Heterogeneous Environments - Part 2: High Efficiency Video Coding; MPEG-H Part2 (ITU H.265, HEVC).

E. Federal Communications Commission (FCC):
   1. FCC Rules and Regulation of Title 47 of CFR Part 15 Subpart B Class A.

F. Open Network Video Interface Forum (ONVIF):
   1. ONVIF - Profiles S Specification.

G. Underwriters Laboratories (UL):
   1. UL listed.

1.5 DEFINITIONS

A. Abbreviations:
1. ARP - Address Resolution Protocol.
2. DHCP - Dynamic Host Configuration Protocol.
3. DNR - Digital Noise Reduction.
4. DDNS - Dynamic Domain Name Server.
5. FPS - Frames Per Second.
6. GUI - Graphical User Interface.
7. HDD - Hard Disk Drive.
8. HTTP - Hypertext Transfer Protocol.
9. ICMP - Internet Control Message Protocol.
10. IGMP - Internet Group Management Protocol
11. IP - Internet Protocol.
12. iSCSI - Internet Small Computer System Interface.
13. JBOD - Just a Bunch of Disks.
14. JPEG - Joint Photographic Experts Group.
15. MJPEG - Motion JPEG.
16. MP - Megapixel.
17. MPEG - Moving Pictures Experts Group.
18. NAS - Network Attached Storage.
19. NTP - Network Time Protocol.
20. POS - Point of Sale.
21. PPPoE - Pont to Point Protocol over Ethernet.
22. RAID - Redundant Array of Independent Disks (Drives).
23. RTP - Real-Time Transport Protocol.
24. RTCP - Real-Time Control Protocol.
25. RTSP - Real-Time Streaming Protocol.
26. SMTP - Simple Mail Transfer Protocol.
27. SNMP - Simple Network Management Protocol.
28. SSL - Secure Sockets Layer.
29. TCP - Transmission Control Protocol.
30. UDP - User Datagram Protocol.
31. UPnP - Universal Plug and Play.
32. VMS - Video Management System.
33. PoS - Point of Sales.
34. VA - Video Analytics.
35. PnP - Plug and Play.
36. ARB - Auto Recovery Backup.
37. NVR - Network Video Recorder.
38. RAID - Redundant Array of Independent Disks.

B. Definitions:
1. JBOD: A collection of hard disks that have not been configured to act as a redundant array of independent disks (RAID) array.
2. GOV (Group of Video object planes): A set of video frames for H.264 and H.265 compression, indicating a collection of frames from the initial I-Frame (key frame) to the next I-Frame. GOV consists of 2 kinds of frames: I-Frame and P-Frame.
3. Dynamic GOV: Dynamic assignment of GOV length based on the complexity of the scene to efficiently manage bitrate of the video stream and reduce the storage required.
4. Dynamic fps: Dynamic assignment of frames per second based on the complexity of the scene to efficiently manage bitrate of the video stream and reduce the storage required.
5. ARB (Auto Recovery Backup): Automatic backup mechanism that enables cameras to store videos on to SD card during failures and stream it to the storage device after recovery.
6. Failover: A feature that automatically switches to a redundant or standby device upon failure or unexpected shutdown of an active device.

1.6 SUBMITTALS

A. Project Initiation:
1. Within fourteen (14) days of Notice to Proceed, the data network system installer shall

furnish the following in a single consolidated submittal:

a. Permits: The Contractor shall obtain all required permits and provide copies to the Owner / Architect / Engineer.

b. Product Literature: Complete manufacturer's product literature for all material, hardware, and equipment to be used in the installation of the specified system. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner / Designer) and the manufacturer's supporting documentation demonstrating compatibility with other related products shall be included. The submittal shall have some type of distinguishing marker or pointer to indicated what specific product is to be provided

c. Construction Schedule: A time-scaled Construction Schedule, indicating general project deadlines and specific dates relating to the installation of the cable distribution system.

d. Specification Compliance: A letter shall be provided stating, by section and subsection, that the SCS installer complies with the entire specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been approved by the Owner.

f. Each Submittal must have a detailed parts list. Quantities will not be required as the quantity of any portion of this system shall be as required for a complete and functional system and in conjunction with the contract documents.

g. Certifications: The contractor shall submit all certifications for approved products and the certifications must contain dates which are valid from the date of proposal and not expirer any sooner than 12 months after substantial completion of the project.

1) Physical Security Professional (PSP) Certification: This certification must be held by an on-staff, full-time employee of the system installer. The holder must be staffed out of the office that is located within 75 miles of the projected.

2) Manufacturer Authorized Dealer Certification must be held by the system installer's office that is located within 75 miles of the project and shall be a company certification, not and individual certification.

3) Installer Certifications: Certification indicating that an individual has successfully completed installer training, issued by the VMS and Cameras Manufacturers specified herein, must be held by at least 25% of the, on-site, staff and be made available at the site if requested by the owner, architect, and/or project's technology consultant.

B. Shop Drawings:

1. Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed:

a. Proposed cable routing and grouping plan.

b. In addition to the cable routing, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:

1) Location of sleeved wall and floor pass-thru
2) Size of sleeve at each location installed
3) Quantity of cable passing through each sleeve
4) Location of devices and head end equipment.
6) Conduit routing, size, and quantity

c. Drawing Compliance: A letter shall be provided stating that the system installer complies with the entire project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. No deviations shall be acceptable until they have been approved by the Owner.

d. All subcontractors shall provide submittals to general contractor for normal distribution to Architects, Engineers and the Owner's project managers.

C. At Substantial Completion: Provide drawings, to the Owner, to reflect installed cabling with correct

labeling and cable routing.

D. Close-out Procedures:

1. Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. Close out technology documents shall be separated from all other trade's documents. The close out finals shall include:
   a. Inspection and Test Reports: During the course of the Project, the Contractor shall maintain an adequate inspection system to ensure that the materials supplied, and the work performed, conform to contract requirements. The Contractor shall provide written documentation that indicates that materials acceptance testing was conducted as specified. The Contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.
   b. Include the Name, address and telephone of the authorized factory representative with a 24-hour emergency service number.
   c. The manual shall also include Manufacturer's data sheets and installation manuals/instructions for all equipment installed a list of recommended spare parts.
   d. Generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.
   e. An up-to-date record ("as-built") set of approved shop drawing prints that have been revised to show each and every change made to the structure cabling system from the original approved shop drawings. Drawings shall consist of a scaled plan of each building showing the placement of each individual item of the technical cabling system equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
   f. As-built Drawings shall include cable pathways, camera locations with correct labeling and MDF/IDF locations. A copy of the As-Built drawings reflecting the final locations of all cabling shall be given to the designated Owner's representative. The as-built drawings shall be prepared using AutoCAD 2012 or later. Provide the Owner with electronic versions of the as-builts on CD media.
   g. All drawings must reflect final graphic numbering, point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.
   h. A copy of the manufacturer's warranty on the installed system.
   i. Any keys to cabinets and/or equipment and special maintenance tools required to repair, maintain, or service the system.
   j. Operating and Maintenance Instructions for all devices within the system. These instructions shall reflect any changes made during the course of construction, and shall be provided to the Owner, for their use, in a three-ring binder labeled with the project name and description. (4 copies)
   k. Upon completion of the work and at a time designated by the Architect or owner, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all included systems and equipment. Minimum amount of training time shall be at least 4 hours.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.

B. System Integrator shall provide the following as part of the System Solution:
   1. Complete product and technical data specification sheets that include all material and equipment and shall be available freely online.
   2. List of all equipment with part numbers, manufacturer, firmware, and assigned IP addresses.
   3. Locations and details for all components to be installed under this scope of work.
   4. Placement Diagram showing the proposed location of all system hardware devices.
   5. System Calculation of all network bandwidth and storage requirements for System Servers to ensure proper planning of computing and networking infrastructure.

C. Installer Qualifications: Minimum 10-year experience installing similar products. Installers shall be trained and authorized by the Manufacturer to install, integrate, test, and commission the system.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
B. Handling: Handle materials to avoid damage.

1.10 PROJECT 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 recommended limits.

1.11 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.12 WARRANTY

A. The security system VMS software and labor furnished by the System Integrator including wiring, software, hardware and third-party products shall be fully warranted for parts, materials and labor for a minimum of 1 year from date of the final acceptance of the Video Surveillance System.

B. Manufacturer shall provide a limited 3-year warranty for the product to be free of defects in material and workmanship.

C. Software Licensing and Warranty:
1. Software licensing should be on a per device basis (e.g. 1 x license for 1 IP Camera or I/O device) with no base license for additional features or capabilities.
2. The VMS Software should be completely free for live streaming or playback of offline media files (images, videos).
3. Lifetime software upgrades shall be provided by the Manufacturer without cost and without the need for an annual maintenance agreement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
1. VMS
a. Video Insight
2. Cameras
a. I-PRO
B. Requests for substitutions will be considered in accordance with provisions of Division 1

2.2 IP SERVER
A. All Servers are existing. Contractor to include any licensing and programming to add new devices to the existing server. The existing server configuration shall dictate the configurations of the newly installed devices.

2.3 CAMERAS
A. Camera Types:
1. Tamper resistant with all movable parts enclosed behind a protective cover.
2. Integrated Dome In-Ceiling flush mount.
3. Water resistant.
4. 3-year warranty on all cameras.
5. Indoor Cameras: Minimum of 4MP resolution per lens

6. Outdoor Cameras: Minimum of 6MP resolution per lens

B. Color Cameras
   1. Acceptable Manufacturers:
      a. I-PRO
      b. Reference Video Surveillance Camera Schedule for model numbers, accessories, and additional information.

C. Field of View Determination by the contractor as necessary for fixed camera locations shall be performed at no additional cost to provide the view desired by the owner. Contractor shall coordinate all final camera views and locations with owner for final approval.

2.4 ADDITIONAL HARDWARE OR EQUIPMENT REQUIRED
A. Licensing
   1. Provide the owner with all licenses as required for installation

PART 3 EXECUTION

3.1 PREPARATION
A. System Integrator: Confirm the solution proposal planning and design with the installing contractor.
B. The network design and configuration to be verified for compatibility and performance with the input/output devices.
C. Network Configuration: Tested and qualified by Contractor prior to remote device installation.
D. Equipment to be tested and configured in accordance with instructions provided by the manufacturer prior to installation.
E. All firmware found in products to be the latest and most up to date provided by the manufacturer, or of a version as specified by the provider of the Video Management Application (VMA).
F. All equipment requiring users to log on using a password to be configured with user/site-specific password/passwords. No system/product default passwords shall be allowed.
G. Confirm hardware will be stored in an environment where temperature and humidity are in the range specified by the Manufacturer.

3.2 INSTALLATION
A. General
   1. Install products per manufacturer's recommendations and approved submittals.
      a. Comply with documentation provided by the System Integrator to ensure all steps have been taken to provide a reliable, easy-to-operate system.
   2. Contractor personnel must comply with all applicable state and local licensing requirements.
   3. Before permanent installation of the system, the Contractor will test the system in conditions simulating the final installed environment witnessed by the System Integrator. Adjust as required until proper operation is achieved.

B. Cable Support:
   1. All wire not installed inside conduit or a designated cable tray system shall be installed in a dedicated cable support system for the entire run of each cable. Including, but not limited to service loops.
   2. The approved cable support system shall be attached directly to the building steel at a serviceable height. In the event that the building steel is not 5’ of the finished ceiling, the contractor shall provide a dedicated threaded rod extending within 5’ of the finished ceiling and mount the J-MOD™ support hook to the treaded rod.
   3. Cable support shall be installed at a maximum of 5’ on center.
   4. All cable installed shall be attached to the support system with plenum rated Velcro and a plenum rated Velcro tie shall be installed between each cable support to keep wires neatly bundled throughout the entire run. Tie wraps will only be allowed to be used inside the control panels as required to manage the wires within each type of panel.
   5. Absolutely no cable, not installed in conduit, will be allowed to be attached directly to the building’s steel or supported in any other method than that stated above.
   6. It is the responsibility of the installing contractor to coordinate with all other trades on the project to insure that the pathway of this system does not interfere with the installation of the other trades and to prevent the installed product of other trades from putting strain on the installed wiring.
   7. Do not route cable through webbing of structural steel.

C. Conduit / Raceway:
1. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per NEC.
2. Conduit and raceway system shall be installed as specified under the general electrical section of the specifications, and per NEC.
3. Minimum conduit size shall be 3/4" EMT. Install conduit per engineered shop drawings.
4. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed or subject to damage.
5. All conduit ends shall have a protective bushing to prevent cable damage. Bushings must be installed prior to installing cable. Cutting bushing to install around installed cables will not be accepted.

D. Fire Wall Penetrations: The Contractor shall avoid penetration of fire rated walls and floors wherever possible. Contractor shall also seal all floor, ceiling and wall penetrations in fire or smoke barriers and in the wiring closet.

E. Wall Penetrations: Where penetrations are necessary, they shall be sleeved with metallic conduit and resealed with an Underwriter Laboratories (UL) approved sealant.

F. Provide three-sided pre-finished metal hood and seal to wall where conduit penetrates exterior wall.

G. Install new roof mounted conduits on portable pipe supports – (low profile type), as manufactured by Portable Pipe Hangers or Advanced Support Products. Provide roof protection pads under each support. Coordinate location and routing with design engineer prior to rough-in or installation of system.

H. Do not install wall mounted cameras into metal fascia. Ensure they are mounted into brick, and sealed top and sides (not bottom)

3.3 EQUIPMENT RACK CONFIGURATION

A. Cable Placement: Cable installation in the wiring closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance location. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.

B. Cable shall be routed as closely as possible to the ceiling, floor or corners to ensure that adequate wall or backboard space is available for current and future equipment. All cable runs within the wiring closet shall be horizontal or vertical within the constraints of minimum cable bending radii. Minimum bend radius shall be observed. Cables shall not be tie-wrapped to electrical conduit or other equipment.

C. All incoming cables shall be routed on the cable tray and neatly dressed down to the patch panels.

3.4 WIRING INSTALLATION

A. General:
1. Cabling between wiring closet and camera locations shall be made as individual home runs. No intermediate splices may be installed or utilized between the wiring closet and the camera location.
2. All cable must be handled with care during installation so as not to change performance specifications.

B. Placement: All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair the Owner’s efficient use of their full capacity.

3.5 DOCUMENTATION

A. Labels: The Contractor shall label all outlets using permanent machine engraved labels approved by the Owner. Label patch panels in the wiring closet to match those on corresponding camera locations. The font shall be at least one-eighth inch (1/8”) in height, block. All labels shall correspond to as-builts and to final test reports.

B. Contractor shall ensure complete typed labeling of all cameras with numbers that correspond to locations on video server. Labeling system shall correspond to the Owner’s labeling system. Verify with Owner. Provide tags (black letters on white labels, plastic coated) on all cables and outlets.

C. All cables shall be labeled at both ends with a machine label and all terminations shall be stenciled with a typed label for quick circuit identification. Labeling shall conform to TIA/EIA standard 606 and include interconnect cable identification numbers.

C. A floor plan, clearly labeled with all numbered camera locations, shall be included in the as-built plans.

3.6 CABLE TESTING - BY MANUFACTURER’S REQUIREMENTS

A. Notification: The Owner/Architect/Engineer shall be notified one week prior to any testing so that the testing may be witnessed.

B. Final Acceptance: Before requesting a final acceptance, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms and timetable for all copper and fiber optic cabling.

C. Procedures: Trained personnel shall perform all testing. Acceptance of the test procedures discussed below is predicated on the Contractor’s use of the recommended products and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation shall be evaluated in the context of each of these factors.

D. Errors: When errors are found, the source of each error shall be determined, corrected and the cable retested. All defective components shall be replaced and retested. Retest results must be entered on the test results form. All corrections shall be made prior to final acceptance test.

3.7 INSPECTION

A. Conformance to the installation practices covered above are to be verified when completed. In some cases, the Owner/Architect/Engineer may observe before acceptance.

3.8 WARRANTY

A Guarantee and warrant all equipment provided for a period of 3 years following date of substantial completion, or a period equal to the stated guaranty/warranty offered by the product manufacturer, whichever is the longest in duration.

B. All such warranties shall include all parts (DVR’s, and Power Supplies).

C. Labor and all other costs as necessary to maintain the equipment in operating condition as intended by the product manufacturer after a period of 1 year shall be negotiated with the owner upon project completion

END OF SECTION

SECTION 28 46 02

EXPANSION OF EXISTING FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all detailed engineering, documentation, materials and devices, installation, calibration, software programming and check-out necessary for a complete and fully operational fire detection and alarm system in accordance with the full intent and meaning of the drawings and specifications including, but not limited to, the following:
   1. Supply, install and connect all hardware necessary to provide a complete and operational fire detection and alarm system.
   2. Supply, install and wire all field hardware, power supplies, power circuits, alarm initiating devices, audible and visual alarm devices, auxiliary control relays, signal initiating and signaling devices, conduits, wires, fittings and all accessories required for the system to perform as specified as required. Use and expand the existing fire alarm control panel.
   3. Supply, install, debug and test all software required to provide all software functions described in accordance with the full intent and meaning of the drawings and specifications.
   4. Coordinate the work specified under this Section with other trades and contractors to assure a complete and fully operational system.

B. The intent of fire detection and alarm system work is specified in this section and indicated on the drawings. The installing contractor shall design and provide a complete system, meeting the requirement of this section. The Contractor shall provide all fire alarm and initiation devices in new and renovated areas required for a complete system acceptable to all governing authorities. Provide proper spacing and coverage of all devices.

C. Contractor to expand existing system.

1.2 RELATED SECTIONS

A. Divisions 22, 23 and 26

B. Fire Suppression Systems

C. Elevators

D. Food Service

1.3 CODES / STANDARDS / REFERENCES (LATEST EDITIONS)

A. National Fire Protection Association (NFPA):

1.	NFPA1	Fire Code
2.	NFPA 13	Systems, Installation
3.	NFPA 17	Dry Chemical Extinguishing Systems
4.	NFPA 70	National Electrical Code
5.	NFPA 72	National Fire Alarm and Signaling Code.
6.	NFPA 80	Fire Doors and Fire Windows
7.	NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems.
8.	NFPA 92A	Smoke Control Systems
9.	NFPA 101	Life Safety code.
10.	NFPA 105	Smoke Control Door Assemblies
11.	NFPA 1221	Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems.
12.	NFPA 2001	Fire Extinguishing Systems, Clean Agent

B. UL: Underwriters Laboratories, Inc.

1.	217	Single and Multiple Station Smoke Detectors.
2.	268	Smoke Detectors for Fire Protective Signaling Services.

3. 864 Control Units for Fire Protective Signaling Services.
4 864 Transient protection
5. 1480 Speakers for Fire Protective Signaling Systems
6. UL Fire Protection Equipment Directory.
7. UL Electrical Construction Materials Directory.

C. Factory Mutual P7825 Approval Guide

D. American National Standards Institute (ANSI).

E. National Electrical Manufacturer's Association (NEMA).

F. Institute of Electrical and Electronic Engineers (IEEE).

G. Electronic Industries Association (EIA-232-C): Interface between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange.

H. Requirements of American Disabilities Act (Public Law 101-336).

I. Local Accessibility Standards, Codes, and Ordinances

J. State Fire Marshall or Requirements of Local Authorities having Jurisdiction

K. State Insurance Code.

L. National Building Code.

M. International Building and Fire Code adopted by Local Authority Having Jurisdiction

N. Uniform Building Code.

O. Local & State Building Codes.

P. In addition the above requirements, comply with all local codes. Where discrepancies exist between codes, drawings or specifications, the more stringent requirement shall prevail. Installation shall be subject to approval, inspection and test of applicable regulatory agencies.

1.4 MANUFACTURER'S, PLANNER'S AND INSTALLER'S QUALIFICATIONS

A. The manufacturer shall regularly and presently produce, as the manufacturer's principle products, the equipment and material of the type and design specified for this project, and shall have manufactured the item for at least 5 years. All components of the system shall be UL compatible with the existing main fire alarm control panel. Manufacturer of all components shall match existing manufacturers of similar or same type components unless otherwise specified or noted on the drawings.

B. The installing contractor shall have been actively engaged in the business of designing, selling, installing, and servicing fire alarm systems for at least ten (10) years.

C. The entire Fire Detection and Alarm System shall be installed by a factory authorized representative of the existing main fire alarm control panel and certified by the manufacturer to distribute, sell, and install the specified fire alarm and smoke detection system. Include all components, elements, and testing and acceptance procedures.

D. If the submitted system is being supplied by an authorized distributor of the equipment manufacturer, the distributor shall have been actively engaged in the sale, installation and service of the type of system proposed for this project for a minimum of 10 years.

E. Any proposed installer who cannot show evidence of such qualifications may be rejected. The services of a technician provided and certified by the equipment manufacturer shall be provided to supervise the installation and tests of the system.

F. Furnish evidence there is an experienced and effective service organization, which carries a stock of repair parts for the system to be furnished.

G. The installing contractor shall be licensed by the State Fire Marshall to design, sell, install, and service fire alarm systems as required by the State Insurance Code.

H. The installing contractor shall have on his staff a minimum of two (2) Fire Alarm Planning Superintendent (APS) licensed by the State Fire Marshall's office for such purpose and under whose supervision installation, final connections, and check out will take place as required by the State Insurance Code.

I. The APS shall be a certified NICET Level III state licensed fire alarm planner under whose supervision system design shall take place. In lieu of a NICET certified state licensed fire alarm planner, the contractor or supplier may provide design supervision by a registered professional engineer, who regularly engages in the design of fire alarm systems.

J. The installing contractor shall provide 24-hour, 365 days per year emergency service with factory trained, state licensed service technicians.

K. Material shall be new and in perfect condition when installed.

L. Electrical or electronic equipment provided under this Division which has been damaged, exposed to weather, or is, in the opinion of the Architect/Engineer otherwise unsuitable because of improper fabrication, storage, or installation, shall be removed and replaced with new equipment, at no additional cost to the owner.

1.5 COORDINATION

A. It shall be the responsibility of the installing contractor to coordinate all requirements surrounding installation of the fire alarm system with all other trades.

1.6 DEFINITIONS

A. General: Wherever mentioned in this specification or on the drawings, the equipment, devices and functions shall be defined as follows:
   1. Alarm Signal: A signal, which signifies a state of emergency requiring immediate action and immediate notification of the Fire Department. These are signals such as:
      a. The operation of a manual station.
      b. The operation of a fire suppression system switch.
   2. Pre-Alarm Signal: A signal, which indicates a detection device, has operated. These signals require and immediate response, but do not require immediate notification of the Fire Department.
   3. Supervisory Signal: A signal, which signifies the impairment of fire protection system, which may prevent its normal operation.
   4. Trouble Signal: A signal, which indicates that a fault, such as an open circuit or ground, has occurred in the system.
   5. Alarm Zone: An alarm initiating device or combination of devices connected to a single alarm initiating device circuit.
   6. Pre-Alarm Zone: A detector or group of detectors connected to a single detector circuit, which can send an alarm to the central control panel.
   7. Supervision Zone: A supervisory signal initiating device or combination of such devices connected to a single supervisory signal circuit.
   8. Communication Zone: A fire alarm indicating device or series of devices arranged to visually and/or audibly indicate a fire alarm signal.

1.7 SUBMITTALS

A. Before the shop drawings are submitted to Architect / Engineer, submit drawings to the Authority Having Jurisdiction for approval. All approvals shall be noted on the drawings or by letter from the Authority Having Jurisdiction. Submit copies of the Authority Having Jurisdiction approved shop drawings to the Architect for review.

B. Fire alarm submittal shall be bound and separate from all other submittals. The installing contractor and/or equipment supplier shall provide complete and detailed shop drawings and include:
   1. Provide a complete written, item-by-item, line-by-line, specification review stating compliance or deviation in full description.
   2. Complete point-to-point wiring diagrams of new equipment.
   3. Complete floor plan drawings locating all new system devices and existing panels used for expansion.
   4. Complete system bill of material.
   5. Detailed system operational description. Any specification differences and deviations shall be clearly noted and marked.
   6. Provide a complete description of system operation.
   7. Manufacturer’s installation instruction.
   8. Bound form with contractor's name, supplier's name, project name, state fire alarm license, Fire Alarm Planning Superintendent license and all Technician(s) license adequately identified.
   9. Submittal sheets sequentially numbered with the format: sheet number of number total. For example: 1 of 3.
   10. Complete set of manufacturer’s operating instructions, circuit diagrams and the information necessary for proper installation, operation and maintenance.
   11. Field and factory wiring diagrams of all new systems and for typical devices showing all connections with all terminals and interconnections identified.
   12. Complete schematic circuit diagrams for all new equipment, including panel modules.
   13. Floor plan drawings including all existing main and new panel and device locations, conduit sizes between devices and panels; number, size and type of conductors between devices and panels; walls, doors and graphic room numbers; exact power requirements and conduit routing with the location of all junction boxes and exact locations of devices and equipment. Submit a floor plan drawing circuiting/zoning shall be identified on the drawings.
   14. Complete wiring, routing, and schematic diagrams, software descriptions, and details required to demonstrate that the system has been coordinated and will function as a system.
   15. Manufacturers catalog cut sheets shall be provide for each piece of equipment with the appropriate model or part number highlighted in cases where multiple model numbers or part numbers are shown.
   16. Detailed list of all hardware components, which are included.
   17. Installation details for each type of field mounted device installed under this contract.
   18. Point-to-point termination schedules with cable identification numbers and terminal strip numbers.
   19. New fire detection and alarm system’s panel configuration complete with peripheral devices, batteries, power supplies, and interconnection diagrams.
   20. Submit a riser diagram of trunk wiring and device-to-device wiring and device to fire alarm control panel wiring. Riser shall show:
      a. Conduit sizes and types.
      b. Number, size and type of conductors.
      c. Fire detection and alarm devices arranged in the required circuiting/zoning, as defined in the specifications and on the drawing.
      d. Battery calculations to show compliance with the requirements of the specifications for both alarm and supervisory mode.
   21. Indicate visual alarm device candela setting required for coverage.
   22. Sample of proposed graphic/text annunciation.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Submit complete sets of operation and maintenance manuals. Manual, less as-builts, and sign-off sheets, shall be provided upon completion of the work. Approval of the manual will be required prior to substantial completion.

B. The Operation and Maintenance Manual shall consist of the following:
   1. The manual shall include the names, addresses and telephone numbers of each Contractor installing products, and of the nearest service representative for each product.

The manual shall have a Table of Contents and tab sheets. Update manuals to include modifications made during installation, checkout and acceptance. The manual shall include the sections described in the following paragraphs.

2. The Functional Design Section shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. Hardware and software functions, interfaces, and requirements shall be provided for system operating modes.
3. The Hardware Section shall describe equipment provided, including general description and specifications, installation and checkout procedure, electrical schematics and layout drawings. Alignment and calibration procedures, manufacturer's repair parts list indicating source of supply, interface definition, signal identification and wiring diagrams. Also, include a complete parts list of all components as well as a list of recommended spare parts. The spare parts list shall include, for each item, the manufacturer's name, the model of the part, and serial number, if appropriate, and a physical and electrical description of the part.
4. The Software Section shall describe programming and testing, starting with a system overview and proceeding to a detailed description of each software module, to instruct the user on programming or reprogramming any portion of the system and other information necessary to enable proper system usage.
5. The Operation Section shall provide instructions for operation of the system, including system start-up procedures, use of system and applications software, alarm presentation (where applicable), failure and recovery procedures, preventive maintenance schedule, parameter schedules and sequence definition, and system access requirements.
6. The Maintenance Section shall provide descriptions of maintenance for equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
7. The Shop Drawings section shall include copies of all approved shop drawings and submittal materials updated to "AS BUILT".

1.9 AS-BUILT DRAWINGS

A. Prepare and submit detailed "As-Built" drawings. The drawings shall include certified test of the system, testing and acceptance sign-off sheets, and other items specified elsewhere to be performed after initial submission of operation and maintenance manuals, complete wiring diagrams showing connections between all devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as built location of all devices and equipment. The drawings shall show the system as installed, including all deviations from both the project drawings and the approved shop drawings. The drawings shall be prepared on uniform sized sheets, the same size as the project drawings. The plan drawings shall be 11x17 inch and inserted in the specified Operations and Maintenance Manuals. Provide electronic copies in PDF and Autocad.dwg format.

1.10 WARRANTY

A. All new fire alarm devices, new panels, new equipment and new accessories, including labor and material, shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of substantial completion. Any equipment or workmanship shown to be defective shall be repaired, replaced or adjusted during normal working hours at no cost to the owner within 4-hour notification.

B. Repair services and replacement parts for the system to be furnished under this Contract shall be available for a period of ten years after the date of final acceptance. Service during the warranty period shall be provided within four hours after notification and all repairs shall be corrected within 24 hours after notification throughout the warranty specified in this section.

C. The installing contractor shall provide 24 hour, 365 days per year emergency service with factory trained, state licensed service technicians.

D. The equipment manufacturer shall be represented by a local service organization and the name of such shall be furnished to the Owner, Architect, and Engineer.

E. Provide a certified fire alarm test of the complete system at the end of the warranty period and

correct any and all items located in the area of renovation to bring the system to an approved status at no cost to the Owner. Clean all smoke detectors and replace all defective parts within the area of renovation at no cost to the Owner.

F. Guarantee labor, materials, and equipment provided under this contract against all defects for a period of one year after the date of final acceptance and receipt and approval of “As-Built” drawings and schematics of all equipment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers acceptable contingent upon Products’ compliance with the specifications:
1. Match Existing main fire alarm panel manufacturer.
a. Notifier NFS2-640e

2.2 SYSTEM DESCRIPTION

A. System shall be a fully functional fire detection and alarm system, tested and left in first class operating condition. Voice evacuation systems where required or specified shall have voice alarm notification wherever audible notification is required.

B. The system shall provide communication with initiating and control devices individually. All of these devices shall be individually annunciated at the fire alarm control panel. Annunciation shall include the following conditions for each point:
1. Alarm
2. Trouble.
3. Open
4. Short
5. Device missing/failed.

C. System circuits shall be wired as follows: Initiating device circuit (IDCs) shall be Style B, indicating appliance circuit (IACs) shall be Style Y, and signal line circuit (SLCs) shall be Style 4 as describe in NFPA 72.

D. The system shall contain independently supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.

E. There shall be supervisory service initiation device circuits for connection of all sprinkler water flow switches and valves. Device activation shall cause a general alarm at the fire alarm control panel. Each flow and tamper switch shall have an individual address.

F. There shall be independently supervised and independently fused indicating appliance circuits for all alarm signaling devices. Disarrangement conditions of any circuit shall not affect the operation of other circuits.

G. Auxiliary manual controls shall be supervised so that an “off normal” position of any switch shall cause an “off normal” system trouble.

H. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the fire alarm control panel. A green “power on” LED shall be displayed continuously while incoming power is present at the building fire alarm control panel.

I. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the building fire alarm control panel.

J. The system modules shall be electrically supervised for module placement. Should a module become disconnected, the system trouble indicator shall illuminate and the audible trouble signal shall sound.

K. The system shall have provisions for disabling and enabling all circuits individually for maintenance

or testing purposes.

L. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal or supervisory mode for a period of 24 hours with 20 minutes of alarm operation at the end of this period as a minimum. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. If batteries are fully discharged, the charger shall recharge them back to full charge in four hours.

M. All external circuits requiring system operating power shall be 24 VDC and shall be individually fused at the respective fire alarm control panel.

N. All addressable devices shall have the capability of being disabled or enabled individually from the fire alarm control panel.

O. A maximum of 90 addressable devices shall be multi-dropped from a single pair of wires. Systems that require factory reprogramming to add or delete devices within the capability of the designed system are unacceptable. Expansion of the designed system shall be accomplished by factory reprogramming.

P. The communication format to the addressable devices shall be a completely digital poll/response protocol to allow t-tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol.

Q. Each addressable device must be uniquely identified by an address code. The system must verify that proper type device is in place and matches the desired software configuration. All remote or external panels shall have an individual address for monitoring.

R. Wiring type, distances, survivability, and wiring configuration types shall be approved by the equipment manufacturer. The system shall allow a line distance of up to 2,500 feet to the furthest addressable device on a Style Y circuit. Fire alarm cable shall have an outer jacket insulation color of red. Minimum wire size shall be #18 AWG.

S. Each panel extender shall have an individual address.

2.3 FIRE ALARM CONTROL PANEL (FACP)

A. Existing to remain.

B. The fire alarm control panel shall be left with 25% spare initiating point and battery capacity for future use.

C. New power supplies (if required) shall provide all control panel and peripheral power needs with filtered power as well as unregulated 24VDC power for external audio-visual devices. The audio-visual power shall be increased as needed by adding additional modular expansion power supplies. All power supplies shall be designed to meet UL and NFPA requirements for POWER LIMITED operation on all external signaling lines, including initiating circuits and indicating circuits. Design the system power supplies and power trunk wiring for all annunciation devices required, and to add a minimum of two (2) 110cd visual devices in the future. Individual circuit design loading shall not exceed 70% of power supply and system wiring capacity when including the additional spare capacity for the 110cd visual devices
   1. Input power shall be 120VAC 60Hz. The power supply shall provide internal supervised batteries and automatic charger. The power supply shall provide positive and negative ground fault supervision, battery/charger fail condition, and AC power fail indicators. The power supply shall also provide supervision of modular expansion power supplies as may be required.
   2. Surge protection shall be integral to the control panels.
   3. Each power supply shall be monitored and have an individual address.

2.4 DIGITAL FIRE ALARM COMMUNICATOR

A. Existing to remain.

2.5 EMERGENCY VOICE ALARM COMMUNICATION SYSTEM

A. Existing to remain.

B. Compatible and UL listed with existing fire alarm system.

2.6 NEW FIELD DEVICES WHERE REQUIRED

A. All devices shall be supervised for trouble conditions. The fire alarm control panel shall be capable of displaying the type of trouble condition (open, short, device missing/failed). Should a device fail, it shall not hinder the operation of other system devices.

B. Visual Signals
1. Strobe lights shall be low profile and operate on 24 VDC. The strobe light shall be capable of producing 75 candela on axis to comply with ADA and UL 1638 requirements, and 15, 30, or 110 candela to comply with UL 1971 requirements. Visual signals in common areas of illumination shall have synchronized flash. Provide white with red letters.
2. All wall mounted strobe units installed in student's toilets, gymnasiums, corridors, student locker/dressing rooms shall have a protective cover.

C. Combination Alarm Signal and High Intensity Visual Signals
1. Strobe lights shall operate on 24 VDC. The strobe light shall be capable of producing 75 candela on axis to comply with ADA requirements, and 15, 30 or 110 candela to comply with UL 1971 requirements. Visual signals in common areas of illumination shall have synchronized flash. Each unit shall provide a Code 3 Temporal tone. The horn shall be capable of an output of 95dB at 10', and intensity adjusted accordingly for the area of coverage. Electronic Mini-Sounder or horn set on low setting shall be provided in interior rooms 900 square feet or less. Mini-sounder shall not be used in any corridors, mechanical electrical rooms and similar large spaces and areas of high ambient noise level. Provide white with red letters.
2. All wall mounted combination units installed in student toilets, gymnasiums, corridors, student locker/dressing rooms shall have a protective cover
3. The audible emergency alarms shall produce a sound that exceeds the prevailing sound level in the room or space by at least 15 dba or shall exceed any maximum sound level with a duration of 60 seconds by 5 dba, whichever is louder. Sound levels for alarm signals shall not exceed 110 dba at the minimum hearing distance from the audible appliance.

D. Exterior Audible Signal:
1. Semi-flush mounted, molded of high impact red thermoplastic and listed for weatherproof locations.

E. Combination Voice Signal and High Intensity Visual Signals (where indicated or required by local AHJ):
1. Strobe lights shall operate on 24 VDC. The strobe light shall be capable of producing 75 candela on axis to comply with ADA requirements, and 15, 30 or 110 candela to comply with UL 1971 requirements. Visual signals in common areas of illumination shall have synchronized flash.
2. All combination units installed in student toilets, gymnasiums, student locker / dressing rooms shall have a protective cover.
3. The visual signal lens housing shall be white with red lettered FIRE or as approved by Architect. The speaker and visual signal shall be mounted to a common white speaker baffle. The visual signal shall flash at a rate of minimum of 1 Hz and maximum of 3 Hz, and shall use a strobe type lamp or other high intensity long life light source. The lamp intensity shall be a minimum of 75 candela.
4. The speaker shall be UL 1480 compatible with the control equipment. Unit shall operate within a temperature range of 150°F to -30°F. High output speakers, UL minimum 87dB at 10 feet with speaker taps of .33.66/1.25/2.5 watts. Standard output speakers, UL 75-81 dB at 10 feet with speaker taps of .5/1/1.75/2.75 watts. Capacitor for line supervision.

F. Ceiling mounted recessed mounted speakers (where indicated or required by local AHJ) shall be UL 1480 compatible with the control equipment. Unit shall operate within a temperature range of 150°F to -30°F. UL minimum 78-87 dB at 10 feet with speaker taps of .25, .5/1.0/2.0 watts. Round, white baffle or 2x2 lay-in grid with UL enclosure, tile bridge supports when recessed in lay-in ceiling tiles (where indicated or required by local AHJ) and capacitor for line supervision.

G. Surface mounted speakers (where indicated or required by local AHJ) shall be UL 1480 compatible with the control equipment. Unit shall operate within a temperature range of 150°F to -30°F UL minimum 100 dB at 15 watts at 10 feet. Speaker taps via 7-position selector switch, 25-vol., .48/.94/1.8/7.5/15 watts. Fully enclosed wiring terminals. Capacitor for line supervision.

H. Manual Pull Station: Addressable pull stations shall contain electronics that communicate the station's status (alarm, normal) to the control panel over two wires which also provide power to the pull station. They shall be manufactured from high impact red Lexan with white lettering. Station shall mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations shall be double action without glass rods. The front of the station shall be hinged to a back plate assembly and shall be opened with a key to reset the station. The key shall be common with the control panels. The addressable manual station shall have address setting programmed electronically and automatically from the fire alarm control panel. Manual stations shall be designed for semi-flush (surface) mounting on standard electrical box. All pull stations units shall have a protective cover, STI Stopper II #STI-1130 surface mounted cover with local alarm horn. Provide STI, Weather Stopper II #STI3150 for locations where dampness, water or dust is present, except when mounted next to main FACP, staff supervised locations, and remote annunciators.

I. Intelligent Multi-Criteria Photoelectric Smoke Detectors
   1. The intelligent multi-criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.
   2. The detectors shall use the photoelectric principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the ANALOG level of smoke density. The detector shall provide automatic sensitivity "drift" compensation. The detector shall also provide a "maintenance alert" feature whereby the detector shall initiate a trouble condition should the unit's sensitivity approach the outside limits of the normal sensitivity window.
   3. The detectors shall provide address setting means electronically and automatically at the control panel.
   4. The detectors shall provide operational status and alarm state LED. Under normal conditions, the LED shall flash, indicating the detector is operational and in regular communication with the control panel. An output connection shall also be provided in the base for connecting an external remote alarm LED.
   5. The detector shall be semi-flush ceiling mounted and be provided with modular detector head with twist lock base. No radioactive material shall be used.
   6. Voltage and RF transient suppression techniques shall be employed as well as smoke signal verification circuit and an insect screen.

J. Intelligent Photoelectric Smoke Detectors
   1. The detectors shall use the photoelectric principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the ANALOG level of smoke density. The detector shall provide automatic sensitivity "drift" compensation. The detector shall also provide a "maintenance alert" feature whereby the detector shall initiate a trouble condition should the unit's sensitivity approach the outside limits of the normal sensitivity window.
   2. The detectors shall provide address setting means electronically and automatically at the control panel.
   3. The detectors shall provide operational status and alarm state LED. Under normal conditions, the LED shall flash, indicating the detector is operational and in regular communication with the control panel. An output connection shall also be provided in the

base for connecting an external remote alarm LED.

4. The detector shall be semi-flush ceiling mounted and be provided with modular detector head with twist lock base. No radioactive material shall be used.
5. Voltage and RF transient suppression techniques shall be employed as well as smoke signal verification circuit and an insect screen.

K. Duct photoelectric smoke detectors:

1. Detectors shall be analog addressable type.
2. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.
3. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel.
4. Voltage and RF transient suppression techniques shall be employed as well as smoke signal verification circuit and an insect screen.
5. Remote alarm/power LED indicator with test switch shall be provided. Unit shall be wall or ceiling mounted in readily visible and accessible area near the location of detector; exact location of unit to be approved by the Architect/Engineer.
6. Detectors shall operate on the same principles and exhibit the same basic characteristics as area type photoelectric smoke sensors. The detector shall operate in air velocities of 300 FPM to 4,000 FPM. Each detector shall interface directly to the system SLC loop without the requirement of interface zone modules.
7. The unit shall consist of a clear molded plastic enclosure (or remote mounted LED status indicator shall be provided next to the smoke detector) with integral conduit knockouts to provide visual viewing of detector/sensor for monitoring sensor operation and chamber condition. The duct housing shall be provided with gasket seals to insure proper seating of the housing to the associated ductwork. Each unit's sampling tubes shall extend the width of the duct and be provided with porosity filters to reduce sensor/chamber contamination.
8. The detectors shall provide alarm and power status indication by LED. Under normal conditions, the LED shall flash, indicating the detector is operational and in regular communication with the control panel. Steady illumination of the LED shall indicate that the control panel has detected and verified an alarm condition. An output connection shall also be provided in the base for connecting an external remote alarm LED.
9. The detectors shall provide address setting means electronically and automatically from the control panel.

L. Intelligent Thermal Detectors

1. The detectors shall use dual electronic thermostats to measure temperature levels in its chamber and shall, on command from the control panel, send data to the panel representing the analog temperature level.
2. The detectors shall provide address setting means electronically and automatically at the control panel.
3. The detectors shall provide operational status and alarm state LED. Under normal conditions, the LED shall flash, indicating the detector is operational and in regular communication with the control panel. An output connection shall also be provided in the base for connecting an external remote alarm LED.
4. The detector shall be semi-flush ceiling mounted and be provided with modular detector head with twist lock base.
5. Thermal Detectors shall be combination rate-of-rise and fixed temperature- rated at 135°F for areas where ambient temperatures do not exceed 100°F and shall be 200°F for areas where ambient temperatures exceed 100°F but not 150°F. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft. Detectors shall have a smooth ceiling rating of 2,500 square feet. Detectors shall be located as shown on the drawings and where required by local code authority.
6. Provide fixed temperature 190°F detector in kitchen and kiln room in lieu of combination rate-of-rise / fixed-temperature type.

M. Auxiliary AHU Relays: Air Products model MR-101C relays shall be provided for HVAC and AHU control and interface. Relays shall be heavy-duty type with contacts rated up to 10 amps at 120V AC, 60 HZ. Relays shall be provided with NEMA I dust cover assembly and be provided with DPDT contacts as well as activated LED indicator.

N. Voltage sensing relays: Addressable control modules for voltage sensing relay interface shall be FCM-1.

O. Monitor Module:
1. Addressable monitor modules shall be provided where required to interface to contact alarm devices. The monitor module shall be used to connect a supervised zone of conventional initiating devices to an intelligent SLC loop.
2. The monitor module shall provide address setting means electronically and automatically at the control panel. A status/alarm LED shall be provided which shall indicate that the monitor module is operational and in regular communication with the control panel, and indicate detection of an alarm condition.

P. Control Module
1. Control/relay modules shall be provided where required to provide audible alarm interface and/or relay control interface. The control module shall be used to connect a supervised zone of conventional indicating devices to an intelligent loop. The zone may be wired class A or class B - field selected. The control module may be optionally wired as dry contact (form C) relay.
2. The control module shall provide address setting means electronically and automatically at the control panel. A status/alarm LED shall be provided which shall indicate that the control module is operational and in regular communication with the control panel and indicate when the device is actuated via the fire alarm control panel.

Q. Auxiliary Interface Points: All auxiliary input points (kitchen hoods, water flow, tamper switches, fire extinguishing systems etc.) shall be connected as required, and addressed as a separate initiating point of annunciation at the fire alarm panel and any remote annunciator as required.

R. Water flow switches / Valve supervisory switches shall be provided and installed by the fire protection contractor and connected by the fire alarm contractor. Wiring of these field devices to the fire alarm system shall be the responsibility of the fire alarm contractor. It is the responsibility of this contractor to ensure the proper function of the system. Each fire protection zone (flow switch) and (Valve switch) shall be addressed electronically and automatically at the control panel as a separate point of annunciation at the fire alarm panel. Coordinate exact location with fire protection contractor and civil drawings.

S. Beam detectors:
1. Microprocessor based beam detectors, consisting of a separate transmitter and matching receiver.
2. Coverage up to 350 ft. X 60 ft.
3. LED status indicators for normal (green), alarm (red), and trouble (yellow).
4. The detectors shall provide address setting means electronically and automatically at the control panel.

2.7 MAGNETIC DOOR HOLDERS, AUTOMATIC FIRE DOORS / SHUTTERS, AND SECURITY GRILLES AND INTERIOR SPACE CONTROLLED ACCESS EGRESS DOORS WITH AUTOMATIC EMERGENCY EGRESS ELECTRIC LOCK EMERGENCY RELEASE

A. Magnetic fire door hold open devices, interface for automatic roll down fire doors/shutters, and interface for security grilles and controlled access egress doors with emergency egress shall be provided. Coordinate with Division 8 and Architectural Drawings for exact location.

B. The operation of any alarm in the fire alarm system shall cause the following:
1. Release of the magnetic fire door holding devices, permitting the fire doors to be closed by the door closer.
2. Permit the automatic roll down fire doors/shutters to close automatically.
3. Permit the security grilles with emergency egress to open automatically.
4. Unlock the electrically controlled access doors in all interior spaces.

C. The magnetic door holders, automatic roll down fire doors/shutters, security grilles, and interior electrically controlled access doors with emergency egress, shall be associated with two smoke detectors located on the ceiling with one on either side of the fire door/shutter, security grille

opening, or interior egress path electrically controlled door. The operation of either of these detectors shall also cause the magnetic holder to release the fire door, the automatic fire door/shutter to close, and the security grille with emergency egress to open.

D. The operation of smoke detectors associated with a magnetic door holder, automatic roll down fire door, security grille, or electrically controlled access door shall transmit a pre-alarm signal to the fire alarm panel.

2.8 REMOTE PAGING UNIT

A. Remote all-call paging unit or to activate one of the pre-recorded messages over the speaker circuits.

2.9 REMOTE ALPHANUMERIC DISPLAY ANNUNCIATORS

A. (Where indicated or required by Local Authority Having Jurisdiction) Remote alpha-numeric annunciator(s) to annunciate all system events and duplicate the displayed status at the main FACP. The annunciator(s) shall be an 80-character display similar to the main FACP and operate via the system RS485 or RS232 serial output terminal from the main FACP. The unit shall operate from FACP 24VDC power and function during system power failure while the system resides on standby batteries. The remote annunciator(s) shall include:
1. Integral time/date clock
2. System reset
3. System silence
4. System acknowledge
5. Display/step switch
6. Integral trouble buzzer
7. LCD contrast adjust
8. Fire Drill Operation
9. Owner’s list of additional remote annunciator control buttons.

B. Annunciator shall upon command display the first system alarm, last alarm, and system alarm count. The following primary controls shall be visible through a front access panel:
1. 80 character alphanumeric display, LCD, LED, or gas plasma
2. Individual red system alarm LED
3. Individual yellow supervisory service LED
4. Individual yellow trouble LED
5. Green “POWER ON” LED
6. Alarm acknowledge key
7. Trouble acknowledge key
8. Alarm silence key
9. System reset key
10. LED test
11. Additional control buttons as directed by Owner.

2.10 AUXILIARY EQUIPMENT MONITORING

A. The fire alarm system shall monitor for alarm, supervisory, and trouble conditions; and annunciate the status of the following equipment when provided, or is existing to remain, as part of this project. A failed status shall activate the trouble alarm.
1. Emergency Generator: Run Status
2. Emergency Generator: Trouble Signal
3. Fire Pump: Run Status
4. Fire Pump: Trouble Signal
5. Emergency Service Communications Systems, as required by NFPA 72 and NFPA 1221.

PART 3 - EXECUTION

3.1 EXPANSION OF EXISTING SYSTEM

A. Testing of existing systems:

1. Provide complete operational test of existing fire alarm system prior to any demolition or construction. Verify operation of each device, control panel, distribution equipment and associated accessories.
2. Provide a complete written report to the Architect, indicating any deficiencies of the existing system in relation to each component's intended function. In addition, provide deficiencies of the existing system with regard to current Code, ADA, and Local Accessibility Standards requirements. Provide the written report 14 days prior to any work related to the expansion of the existing system.
3. Testing of the existing system shall include all areas and all buildings served by the existing system.

B. Expand the existing system in all expansion or renovation areas to include requirement specified and as required by the local authority having jurisdiction. Verify compatibility of new equipment with existing system.

C. Provide smoke detectors in the following locations in addition or renovated areas:
1. All paths of egress and adjoining spaces within the same envelope including but not limited to: corridors, hallways, stairs, lobbies, and elevator landings.
2. At each electrical room, telecommunications/data room, elevator machine room, kiln room, and mechanical room not subject to un-treated or un-filtered outside air.
3. At each computer lab/room.
4. At each library or book storage room.
5. At each storage room, stock room, or warehouse space.
6. At each pre-K and kindergarten classrooms.
7. At nurse's area/clinic and patient care/cot areas.
8. At each special needs, life skills, adaptive behavior, developmental classrooms or similar designated areas without food preparation or cooking equipment.
9. At each student toilet/restroom. Provide STI protective covers. Do not locate over plumbing fixtures or near partitions.

D. Provide heat/thermal detectors in the following locations in addition or renovated areas:
1. At each mechanical room subject to un-treated or un-filtered outside air.
2. At each janitor's closets and laundry rooms.
3. At each commercial kitchen and adjoining storage rooms; at each food preparation area.
4. At each employee break room.
5. At each vocational shop.
6. At each science, physics, chemistry, or biology classroom and their associated preparation and storage rooms.
7. At each special needs, life skills, adaptive behavior, developmental classrooms or similar designated areas with food preparation or cooking equipment.

E. Provide carbon monoxide detection and smoke detection devices in all areas designated as day-care for minors.

F. Provide duct smoke detectors in all air handling units with air volumes of 2,000 cfm or larger.
1. Where duct smoke detectors are installed above ceilings, provide external remote status/alarm LED mounted flush with ceiling in close proximity to the duct detector location. If space is open without ceiling, wall mount remote status/alarm LED in close proximity to the detector between 96 and 108-inches AFF, or as directed by Owner.

G. Provide duct smoke detectors on outside air units only as required by local Code and / or AHJ.

H. Provide VESDA type detectors at the following locations when appropriate:
1. Atriums to avoid exposed conduits.
2. High ceiling areas 25 feet and higher where maintenance of spot type detectors will be difficult.
3. Skylights to avoid exposed conduits.
4. Coolers/Freezers 200 square feet and larger.

I. Provide manual pull stations at each exterior exit and at each exit from all floors only if required by local AHJ or if the building is not fully sprinklered. Provide one manual pull station at the central reception area as directed by Owner.

J. Provide weatherproof exterior audio/visual alarm devices mounted on the building at the exact location as directed by Architect:
   1. Main entry.
   2. Courtyards and outdoor assembly areas adjacent to the building.
   3. Mechanical yards adjacent to the building.
   4. Covered playgrounds or covered assembly areas adjacent to the building.
   5. Additional locations where indicated on drawings.
   6. Outdoor paved play areas.

K. Provide audio and visual alarm devices in all areas normally occupied by students or minors and all common use areas.

L. Provide beam type detectors at the following locations when appropriate:
   1. Atriums.
   2. High ceiling corridors where maintenance of spot type detectors may be difficult.
   3. Areas with skylights.

M. Provide audio and visual alarm devices in all areas normally occupied by students or minors. The renovated and expansion areas' smoke control envelope audio alarm shall be equipped with voice alarm capability regardless of local AHJ requirements. Existing areas shall remain temporal audio alarm only.

N. Provide carbon monoxide detection and smoke detection devices in all areas designated as day-care for minors.

O. Provide carbon monoxide detection in classrooms and other instructional spaces served by a fuel-burning appliance, fuel-burning HVAC equipment (including roof mounted equipment), or with gas fuel outlets for connection to portable fuel-burning space heaters and appliances such as Bunsen burners which are typically used in laboratories or science classrooms.

3.2 GENERAL REQUIREMENTS

A. Installation shall include the delivery, storage, setting in place, fastening to the building structure, interconnection of the system components, alignment, adjustment and all other work, whether or not expressly specified, which is necessary to result in a tested and operational system.

B. All installation practices shall be in accordance with, but not limited to, the specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements and recommendations of NFPA 72 and the National Electrical Code and any authorities having jurisdiction. Proper protection against corrosion shall be provided on all electrical equipment in accordance with the requirements of the National Electrical Code. The installation shall conform to all manufacturers' recommendations.

C. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise. Fastenings and support shall be adequate to support their loads with a safety factor of at least three.

D. All boxes, equipment, etc., shall be plumb and square. The contractor must take such precautions as are necessary to prevent and guard against electrostatic hum, to supply adequate ventilation, and to install the equipment to provide reasonable safety for the operator.

E. Visual displays, GUIs, or other indicators for main fire alarm panel and all remote annunciators shall be at maximum 66 inches AFF.

F. All remote booster and associated equipment panels shall be mounted with top of enclosure maximum 66 inches AFF.

G. In the installation of equipment and cables, coordinate with Architectural drawings for possible conflicts with millwork, casework, marker boards, furniture, lockers, etc., and notify the architect of any discrepancies. Verify modifications before proceeding with installation.

H. Mount end-of-line resistor for each box circuit in backbox located at the last manual alarm station or automatic initiating device in a circuit. Mark device accordingly in the field.

I. Provide three dedicated Cat 6 cables from MDF/IDF to fire alarm panel. Cable shall be installed in 3/4" conduit. Two cables for phone POT lines and one Ethernet data connection.

J. Upright and/or Wall Post-Indicating Valve: Provide conduit and wiring from fire alarm control panel to post-indicating valve if electronically supervised, coordinate exact location of PIV with fire sprinkler contractor prior to rough-in. Coordinate final location with Civil Drawings and Fire Protection Contractor. Where equipment is located inside a vault, stub required conduit inside vault, turn up and cap.

K. Contractor shall submit on completion of system verification, a point-by-point check list indicating the date and time of each item inspected and issue a certificate confirming that the inspection has been completed and the system is installed and functioning in accordance with the Specifications prior to date of substantial completion.

L. Provide remote alphanumeric display annunciators in the administrative area in constantly attended area, as required by the Local AHJ, and additional annunciators where indicated on the drawings, as directed by Owner / Architect.

M. Alarm devices shall be ceiling mounted unless indicated specifically otherwise. Alarm devices in Mechanical, Electrical, Communications, IDF / MDF Rooms and Central Plant shall be wall mounted and coordinated with other equipment, piping and ductwork.

N. Provide combination speaker strobes. Provide strobe only alarms when additional speaker placement will compromise voice intelligibility. Provide horn/strobes in coolers and freezers.

O. Detectors shall be installed per NFPA 90A and be listed with the fire alarm control panel.

P. Auxiliary Equipment Monitoring Wiring and connection to equipment shall be the responsibility of the fire alarm contractor.

Q. Power for magnetic door holders shall be provided from the nearest receptacle circuit wired through fire alarm relay.

R. Smoke detectors shall be mounted to a 4-inch octagon box with hanger bar or with box secured to building structure.

S. Provide power via 120-volt, 20-Amp dedicated circuits with lock-on provisions at the respective circuit breaker for each new main fire alarm control panel, each new panel extender and each new remote power supply at no additional cost to the Owner. The complete fire alarm system shall be powered under emergency power when emergency life safety power is available at the project site. When emergency life safety power is not available at the project site, power shall originate from the nearest available 120-volt panel, or as indicated.

3.3 CABLE AND BOXES INSTALLATION

A. All circuits shall be protected to avoid interruption of service due to short-circuiting or other conditions, which might adversely affect the connected devices. Each individual signaling circuit shall be classified as a circuit pair.

B. All cabling in racks, cabinets and junction boxes shall be neatly strapped, dressed and adequately supported. Cable installation shall conform to good engineering practices and to the standards of the National Electrical Code.

C. Cables shall be terminated with the proper connector required for the associated operation of the equipment to which it is connected. Screw terminal blocks shall be furnished for all cables, which interface with racks, cabinets, consoles or equipment modules.

D. All cables within a rack, console or junction box shall be grouped according to the signals being

carried to reduce signal contamination.

E. Where shielded conductors enter a panel or enclosure, and where power wiring exists, provision shall be made to provide physical isolation of signal and power conductors.

F. Supply and install all fittings and accessories whether or not they are specified, required for proper, safe and reliable operation of the system.

G. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit fill shall not exceed 40%.

H. Minimum conduit size shall be 3/4" EMT with insulated bushings. Install conduit per engineered shop drawings.

I. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed to view and or subject to damage.

J. All vertical wiring and all main trunk/riser wiring shall be installed in a complete raceway/conduit system. All riser boxes shall be adequately sized for the number of conductors transversing the respective box as well as the number of terminations required.

K. All junction boxes containing fire alarm wiring are to be painted red.

L. All plenum wiring is to be installed parallel and perpendicular to the building structure. Cable shall be bundled with cable ties on a maximum of 2'-6". Install cables in D-ring hangers secured to the structure at a maximum of 5' on center. Cable shall not lie on ceiling grid or ceiling tiles, light fixtures, piping, ductwork or foreign equipment.

M. The system ground is to be connected to the local ground bus. Under no conditions shall the AC neutral either in a power panel or in receptacle outlets be used for a reference ground.

N. All wiring shall be in accordance with NFPA 72, the National Electrical Code, and Local Codes. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.

O. All wire shall be UL Listed FPL for limited energy (300V) and fire alarm applications and shall be installed in conduit. Limited energy FPLP or MPP wire may be run open in return air ceiling plenums provided such wire is UL Listed for such applications and is of the low smoke producing fluorocarbon type and complies with NEC Article 760 and approved by the local authority having jurisdiction.

P. No other wiring shall be run in the same conduit as fire alarm wiring.

Q. All fire alarm wiring to be red. All fire alarm circuits shall be identified at each termination and at each 25 feet between terminations.

R. Copper wiring leaving or entering main building shall be protected on both ends with surge suppression; otherwise use fiber-optic cabling.

3.4 ALARM SYSTEM SEQUENCE OF OPERATION

A. General:
1. All fire alarm circuits shall be electrically supervised.
2. Automatic response functions shall be accomplished by the first device initiated. Alarm functions resulting from initiation by the first device shall not be altered by subsequent alarms. An alarm signal shall be the highest priority. A pre-alarm signal shall have second priority and supervisory or trouble signals shall have third and fourth level priority. Signals of a higher level priority shall take precedence over signals of lower priority even though the lower priority condition occurred first.

B. Fire alarm operating sequences shall be as follows:

1. Activation of any automatic detector, manual station, fire suppression system, sprinkler flow switch or any other system required by NFPA 72 to be monitored to initiate an alarm condition shall cause the location of the alarm to be identified in an audible and visual manner at the building fire alarm control panel (FACP), and shall initiate the following events:
   a. The system common alarm LED on the CPU Module shall flash. The internal audible trouble device shall sound. Acknowledging the alarm condition shall silence the audible trouble device and revert the flashing common alarm LED to a steady state.
   b. The 80-character display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location based on actual room graphic name and number (not architectural plan names and numbers), and time of alarm. Location and zoning messages shall be custom field programmed to respective premises.
   c. Any remote or local annunciator LED's associated with the alarm point shall be illuminated as herein specified.
   d. The remote signaling connection shall be activated relaying the alarm signal to an approved central station (central station connection and service provided by Owner). Point ID and descriptor must be sent and received.
   e. All automatic events programmed to the alarm point shall be executed and the associated indicating devices and/or outputs activated.
   f. De-activate local sound reinforcement systems that are not UL listed nor integrated with the fire alarm system control panel for providing fire alarm or mass notification instructions. Building wide public address systems shall remain active only for manual mass notification. Public address system auxiliary audio inputs used for background music or other remote non-emergency audio sources shall be silenced to only allow priority level manual mass notification using the public address system.
   g. Activate all audible/visual alarm devices. Where prerecorded voice announcement is required or specified, the prerecorded announcement shall be preceded with attention tone(s), followed by the approved prerecorded announcement and continue in a cycle until the system is reset. Manual voice announcement shall interrupt the prerecorded cycle and the prerecorded cycle shall resume automatically after three minutes.
   h. De-activate all HVAC systems including low speed high volume (LSHV) circulating blade type fans.
   i. De-energize the kitchen hood supply/exhaust fans as required by local authority having jurisdiction.
   j. Close all related smoke dampers.
   k. Close all related smoke/fire dampers.
   l. Release all magnetic door hold open devices.
   m. Release the electric strike, unlocking, but not unlatching, locked doors controlled by an access control system.
   n. Release Counter Shutters and hold-open devices on all fire and smoke doors.
   o. Open all security grilles with emergency egress.
   p. Activate to close all related fire and smoke doors and shutters.
   q. Activate signaling connection to the elevator as required by the local authority having jurisdiction.
   r. Signal the building automation system and Owner’s security / police personnel as directed by Owner / Architect. The audible alarms shall be inhibited from being silenced for a period of 3 minutes after commencing operation unless alarm is acknowledged, and appropriate action has been taken.
   s. Activate automatic recall operation of elevators as required by local authority having jurisdiction.
   t. Record all events on the system printer.
2. Activation of duct mounted smoke detector on the HVAC equipment, or a smoke detector mounted in the return/supply air stream of any fan shall shut down all units as required by NFPA. The activation of one of these detectors shall initiate the Alarm Sequence of Operation.
3. Activation of a control valve supervisory switch shall initiate the following events:

a. The activation of any sprinkler valve supervisory (tamper) switch shall activate the system supervisory service audible signal and illuminate the LED at the building fire alarm control panel (FACP). Differentiation between valve tamper activation and opens and/or grounds on the initiation circuit wiring shall be provided.
b. Activation of a sprinkler system control valve supervisory switch shall not prevent the events listed under Article 3.4.
c. Restoring the valve to the normal position shall cause the supervisory service audible signal to pulse, indicating the restoration to normal position. The supervisory service reset key shall be provided to silence the audible signal.

4. Activation of the smoke detector and heat detector in the elevator machine room and at top of elevator shaft shall cause the elevators' controllers to be tripped by way of the shut trip breaker, and shall also initiate the events listed under Article 3.4.
5. Any subsequent fire alarm shall reactivate the alarm indicating appliances and activate the respective control sequences described above.
6. Upon silencing the alarm, all visible alarm devices shall remain active until system reset, and all local sound reinforcement systems de-activated by the fire alarm system shall resume normal operation.
7. Upon reset of the fire alarm control panel, HVAC units shall be capable of being started, and resume normal operation.

C. Activation of the manual evacuation pull (drill) switch shall operate the alarm indicating appliances and de-activate local sound reinforcement system without causing other control circuits to be activated. However, should true alarm occur, all alarm functions should occur as described.

D. ALARM VERIFICATION shall be field programmed for each respective detector. Global verification will not be acceptable. The verification sequence is activated after a "check" procedure and the panel will wait a field programmable delay period (0-50 seconds) then proceed to re-sample the detector for continued presence of smoke. If the alarm condition still exists or a non-verified device is actuated during the verification period, the system will then initiate all alarm sequences specified herein. The system shall incorporate the ability to log in memory the number of verification events that have occurred for each selected device.

3.5 EQUIPMENT IDENTIFICATION

A. Each new panel or equipment enclosure shall be provided with a permanently engraved or embossed or silkscreen identification tag. The tag shall include the following information:
1. Name of manufacturer.
2. Manufacturer's equipment description.
3. Serial number and model number.
4. Voltage and current rating.

3.6 SPARE PARTS AND TOOLS

A. Interchangeable Parts: All spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the site in unopened cartons for storage as directed by the Owner.

B. Spare Parts: Provide minimum of one, or 5% of renovation area total, whichever is greater unless noted otherwise.
1. Spare shut down modules
2. Spare detectors of each type in the system
3. Spare alarm indicating devices of each type in the system
4. Spare manual pull stations
5. Spare protective covers of each type in the system.
6. Spare relays/controls required for connection to smoke and fire/smoke dampers
7. Devices listed above are to be installed as directed by Architect/Engineer or local code authorities at no additional cost to the Owner. Unused spare parts are to be parts for Owner's cabinet.

C. Provide one smoke, heat and carbon monoxide detector testing kit. SDfire #TF2823 with Solo Testfire #2001 tester with 15-foot access pole and three 4-foot pole extensions, detector removal tool, and carrying bag.

D. Provide two copies of the final software programmed into the fire alarm system.

E. Parts list: Furnish a list, in duplicate, of all other parts and accessories the manufacturer of the system recommends to be stocked for maintenance.

3.7 KEYS

A. Keys and locks for all equipment shall be identical to the existing building master key for the fire alarm system.

3.8 SMOKE DAMPERS AND FIRE/SMOKE DAMPERS

A. Smoke dampers and combination fire/smoke dampers shall be controlled by an automatic alarm initiating device. Smoke dampers installed to isolate the air handling system shall be arranged to close automatically when the system is in alarm.

B. Coordinate motor operator voltage with supplier.

C. Open all dampers prior to starting air handling equipment.

D. Provide 120V power from nearest general purpose 20A receptacle circuit as required, or as noted otherwise.

3.9 GRAPHIC FLOOR PLANS FOR AHJ SITE PERMITTING INSPECTION AND OWNER USE

A. It is the intent of these specifications that the fire alarm system shall pass AHJ inspection on the first try. The fire alarm system shall be fully functional, commissioned, and mapped both on fire alarm graphic maps and fire alarm annunciator device descriptions to fully and correctly described the device type and detailed location. Provide color coded floor plans detailed with actual room names, actual graphic room numbers as directed by the Owner and adequate information to direct people to the fire alarm devices in alarm and to exits with non-fading floor plan media. Do not use architectural plan room names and numbers. Fire alarm maps shall include all relevant building information and fire alarm device information as required for the local AHJ permitting site walk-through inspection.

B. Each plan shall clearly relate the room numbers on the annunciator to the area description on the floor plan. All fire alarm devices located to correspond with the annunciator.

C. Provide two color coded floor plans for Owner use that shall be solvent welded in acrylic plastic.
1. Mount in an extruded aluminum frame next to the main fire alarm control panel.

D. Install graphic floor plans as directed by Architect/Owner prior to substantial completion. Each area or room designation shall be verified with the fire alarm device during testing.

3.10 ADDITIONAL REQUIREMENTS

A. Coordinate with Owner for appropriate off-site monitoring service and communication technology to be used. Provide all necessary programming for interfacing with the Owner’s on-site and off-site remote signaling receiving station, including programming of descriptors and addresses at the receiving station.

B. The contractor is to ensure all areas of the renovation and new construction are covered with visual and audio alarm devices for occupant notification of a fire alarm including remote portable or temporary buildings.

C. Coordinate door hold devices with door and door hardware.

D. Provide interface with and coordinate shunt-trip circuit breakers and control devices with kitchen

hood fire control systems (where new kitchen hood fire control systems are provided) and elevator equipment (where new elevators are provided).

E. Alarm circuit power supplies and circuiting shall be designed and installed to accept an additional five (2) 110cd visual devices for future expansion. The initial design shall not exceed 70% of the rated power supply and circuit capability with the two additional 110cd devices installed.

F. Provide programming or re-programming of all hot keys as directed by Owner including, but not limited to, fire drill, AHU shutdown bypass, horn/strobe disable, elevator test.

3.11 COMMISSIONING THE SYSTEM

A. The installing contractor shall be responsible for verifying that each new or relocated component of the system is fully operational and in conformity with the specifications. He shall also be responsible for insuring that all elements function together as a system in accordance with the specifications.

B. A state licensed and factory trained technical representative of the manufacturer with NICET Level 3 minimum certification shall supervise the final control panel connections and testing of the system. Upon completion of the acceptance tests, the owner and/or his representatives shall be instructed in the proper operation of the system.

C. The installing contractor shall functionally test each and every device in the entire system for proper operation and response. Any new or relocated items located within the construction or renovation area found not properly installed or non-functioning shall be replaced or repaired and retested. The final test indicating a fully functional fire alarm system shall be recorded; electronic Excel and printed copy submitted to the Architect, Engineer and Owner.

D. The installing contractor shall provide a complete written report and printout of the functional test of the entire system after all existing deficiencies of the existing system have been corrected by the Owner, or as directed by the Owner. The test report shall be signed and dated by the licensed fire alarm superintendent responsible for supervising the final system test and checkout. This test shall be completed and accepted by the Owner prior to testing for the local Fire Marshall.

E. The installing contractor's fire alarm superintendent shall test the entire system in the presence of the local authorities having jurisdiction. The contractor shall be responsible for making any changes, adjustments, or corrections, as may be required by the local authorities. The Contractor shall affix his certification label and installation certificate to the interior of the main fire alarm control panel.

F. The testing and acceptance shall be performed within 30 days after the fire alarm installation is completed. The test shall be performed by a minimum of two qualified fire alarm system technicians acceptable to the authority having jurisdiction. The test which is a comprehensive 100 percent inspection and test of all fire alarm system equipment shall include the following:
   1. Fire alarm control equipment: a visual and functional test of the fire alarm control and auxiliary control equipment.
   2. A visual inspection shall be conducted to establish that all electrical connections and equipment, as required, are properly installed and operating.
   3. A functional fault simulation test shall be conducted on all relevant field wiring terminations to ensure that wiring is properly supervised as required.
   4. Indicators shall be tested to ensure proper function and operation.
   5. Control panel auxiliary functions shall be functionally tested to verify proper operation.
   6. Control panel supervisory and alarm current readings shall be taken to verify that the control panel has the appropriate power supplies and standby batteries to operate the system as required. A three-minute general alarm stress test, both under AC power and standby power, shall be conducted to further ensure complete operation of the system.
   7. Fire alarm peripheral devices; All fire alarm peripheral devices shall be functionally tested and the location and testing information recorded for each device.
   8. Manual initiating devices:
      a. Each manual fire alarm station shall be functionally tested for alarm operation.
      b. Each manual fire alarm station shall be functionally tested for proper wiring

supervision.

9. Automatic initiating devices:
   a. Each automatic initiating device shall be activated in accordance with manufacturer's instructions to ensure proper operation.
   b. Each automatic initiating device shall be functionally tested for proper wiring supervision.
   c. Each automatic initiating device shall be inspected to ensure proper placement and mounting as required by specifications.
10. Alarm signaling devices:
   a. Each alarm signaling device shall be tested and decibel reading taken at 10' from the device and recorded to ensure proper operation. Each area's voice alarm signaling devices shall be tested for intelligibility.
   b. Each alarm signaling device shall be functionally tested for proper wiring supervision.
   c. Decibel reading shall be taken to ensure that the alarm signal level can be clearly heard in all areas of the facility.
   d. All visual alarm indicators shall be functionally tested to ensure proper operation and that they are clearly visible.
11. Elevators: Each elevator shall be tested and automatic recall function verified.
12. Reporting: Upon completion of the initial verification audit, a report shall be sent to the Architect/Engineer indicating that all fire alarm equipment has been tested and is in 100 percent operation. The report shall also contain the audit testing information as to the location and operational status of each peripheral device. The 100 percent audit shall be performed by a factory-trained representative. The report shall include the voice intelligibility performance in each area and indicate compliance with NFPA and local AHJ requirements.

G. It is the intent of these specifications and of the Architect/Engineer that a continued program of system maintenance will be provided by the Owner in compliance with NFPA 72. It is mandatory that the installing Contractor provide such services and make available these services to the Owner upon completion of the project.

H. Upon completion of installation and full acceptance testing, submit NFPA 72 certificate of compliance that the total fire alarm system, including any subsystems, is fully functional and that the components are UL listed for function intended.

3.12 SUBSTANTIAL COMPLETION

A. Final acceptance of the FIRE ALARM SYSTEM by the owner, local code authorities and Occupancy Permit has been issued.

B. All fire alarm system shop drawings, operating and maintenance manuals, maps and as-built drawings shall be submitted to and accepted by the Architect / Owner prior to date of substantial completion.

END OF SECTION

SECTION 31 00 00

SITE EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Operations required for the excavation of materials on site.

1. Operations required for the excavation of borrow material from approved sources.
2. Compaction of natural subgrades.
3. Placement and compaction of embankments to grade.
4. Finish grading.
5. Disposal of excess or unsuitable materials.
6. Other required operations.
7. Earthwork must conform with dimensions and typical sections shown, and within lines and grades established on the Drawings.

B. The Contractor shall inform and satisfy himself as to character, quantity and distribution of material to be excavated.

1.2 EXISTING UTILITIES

A. The plans show the approximate location of all known underground utility lines and structures. Where pipes, ducts and other structures are encountered in the excavation but are not shown on the plans, immediately notify the Owner's Representative.

1.3 CLASSIFICATIONS

A. Top Soil: Top 6 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes grasses and other vegetation.

B. Subgrade: Consists of that portion of the surface on which a compacted embankment or pavement is constructed.

C. Compacted Embankment: Earth fill placed and compacted between subgrade and underside of pavement and fill areas adjacent to paving.

D. Borrow: Material taken from approved sources to make up any deficit of excavated material. The borrow shall have a measured plasticity index of between 7 and 20, and shall be free of organic matter and excess silt.

E. Finish Grading: Operations required for smoothing disturbed areas that are not overlaid with pavement.

F. Stripping of Ground Surface: All vegetation, all decayed vegetable matter, rubbish and other unsuitable material within the areas to be graded not removed by clearing shall be stripped or otherwise removed to ground level before grading or other earthwork is started. In no case will such material be allowed to remain in or on the areas to be graded.

G. Excavation: After all necessary stripping has been done, excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings.

H. Compaction: Compaction of soil materials shall be measured as a percentage of Standard Proctor

density as determined by the AASHTO Standard T 99 procedure.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Furnish, operate and maintain such equipment as is necessary to produce uniform layers, section and smoothness of grade for compaction and drainage.

B. Tamping Rollers:

1. Use tamping rollers with one or more cylindrical drums. Each cylinder must be at least 48 inches long and 40 inches in diameter.
2. The minimum weight per linear foot of drum length must be 1500 pounds weighted and 1000 pounds empty.
3. For tamping rollers with multiple cylinders, each cylinder must rotate independently and the cylinders must be pivoted on the main frame so that the units can adapt to irregularities in the ground surface.
4. Provide approximately 2.7 tamping feet per square foot of drum surface on each cylinder. Stagger the feet uniformly over the cylinder surface. Each foot should have a face area between 5 and 7 square inches and a clear projection from the cylinder surface of 7 to 9 inches. Equip each unit with a device for cleaning the feet as the cylinders rotate.
5. Use a crawler tractor with sufficient power to pull the tamping roller at a speed of approximately 3.0 miles per hour.

C. Rubber Tire Rollers:

1. Use rubber tire rollers having two axles and not less than a total of nine wheels with pneumatic tires.
2. Mount the wheels so that the rear tires will not follow in the tracks of the forward tires and so the unit will give uniform compaction over the entire width of coverage.
3. Mount the axles in a rigid frame with a loading platform or body suitable for being ballasted to a specified gross weight between 10 and 50 tons loading. The Owner's Representative will specify the tire inflation and gross weight.
4. If the roller is not self propelled, the towing equipment must also have pneumatic tires.

D. Use tank trucks, pressure distributors or other equipment designed to apply water uniformly and in controlled quantities to variable surface widths.

E. Scarifiers, disks, spring tooth or spike tooth harrows, earth hauling equipment and other equipment must be suitable for construction of fills.

2.2 EARTH FILL

A. Obtain embankment fill from required excavation or, if excavated material is not sufficient, from Borrow areas approved by the Owner's Representative.

B. Use the best material available from excavation or borrow. Suitability of fill material is subject to the approval of the Owner's Representative.

C. Fill material must be free of excessive silts. Do not use soil containing brush, roots, sod or similar perishable material.

D. Embankment material must have a plasticity index between 7 and 20 inclusive.

PART 3 EXECUTION

3.1 REMOVAL OF TOPSOIL

A. Remove topsoil within the limits of the construction areas as shown on the Drawings.

B. Stockpile the topsoil for future distribution. Protect stockpiled topsoil from other excavated materials.

3.2 EXCAVATION

A. As shown on the Drawings, excavate to lines, grades and elevations required for subsequent construction of embankments or pavement. Remove materials within the indicated limits and dispose of as directed.

B. Maintain grades during excavation for complete drainage. When required, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the Work.

C. If at time of excavation it is not possible to place material in the proper section of permanent construction, stockpile the material in approved areas for later use.

D. Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.

E. Uniformly dress cut and fill slopes to slope, cross section and alignment, as shown.

3.3 SUBGRADE UNDER PAVEMENTS

A. After excavation is made to subgrade lines under proposed pavements, remove and replace soft or undesirable material with select material as specified for embankments. Stabilize and compact the subgrade as stated in the sections on stabilization of pavement subgrade.

3.4 TREATMENT OF NATURAL SUBGRADE UNDER EMBANKMENTS

A. After excavation is made to lines under proposed embankments, remove soft or undesirable material to a depth determined by the Owner's Representative. Break down sides or holes or depressions to flatten the slopes.

B. Fill each depression with the appropriate soil for the materials to be placed on the subgrade. Place the fill in layers moistened and compacted as specified in this section.

C. After depressions have been filled and immediately before placement of compacted fill in a section of the embankment, thoroughly loosen the foundation material to a depth of 6 inches. Remove roots and debris turned up while loosening the soil.

D. Compact the surface of the embankment subgrade as specified in the following paragraphs.

E. Take care to prepare the embankment so that planes of seepage or weakness are not induced. Should the Owner's Representative suspect such a deficiency, the material must be thoroughly broken and recompacted before proceeding with construction.

3.5 PLACING EMBANKMENT FILL

A. Do not place fill on any part of the embankment subgrade until the subgrade preparation has been inspected by the Owner's Representative.

B. During the dumping and spreading process, remove all roots, stones and debris that are uncovered in the embankment material.

C. After dumping, spread the material in horizontal layers over the entire fill area. The thickness of each layer before compaction must not exceed 8 inches unless otherwise directed. As soon as possible after placement begins, crown the surface to drain freely and maintain such conditions throughout construction.

D. If the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.

E. Stabilize and compact the top 6 inches of embankment fills under pavement sections as specified in the section on stabilization of pavement subgrade.

3.6 MOISTURE CONTROL

A. Developing the maximum density obtainable with the natural moisture of the embankment material is preferred. However, the moisture content must be 1 to 3 percentage points wet of optimum, as determined by AASHTO Test Method T99.

B. If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by discing or harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other approved method.

3.7 COMPACTION

A. Compact each layer of embankment with suitable rollers as necessary to secure at least 95% of the standard Proctor density, within the specified range of the moisture content, according to AASHTO Test Method T99.

3.8 DISTRIBUTION OF TOPSOIL

A. Preparation:

1. Prior to placing topsoil, scarify the subgrade to a depth of 2 inches to provide effective bonding of the topsoil with the subgrade. Use a chisel plow with the chisels set 10 inches apart.
2. Shape all areas designated for grading, including cut and fill areas, to receive a minimum of 6 inches of topsoil.
3. In areas that require only blading and dressing, the adequacy of existing topsoil will be determined by the Owner's Representative.

B. Placement:

1. Do not haul or place wet topsoil. Also prohibited is placement of topsoil on a subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
2. Distribute topsoil uniformly and spread evenly to an average thickness of 6 inches. Do no compact topsoil. Correct irregularities in the surface to prevent formation of depressions where water could stand.

3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth and suitable for lawn planting.

C. Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement. Replace topsoil.

3.9 MATERIAL DISPOSAL

A. Remove excess excavated material and excess topsoil from the area before substantial

completion. Stockpile materials separately in designated areas. Excess soil, topsoil and strippings shall become property of the Contractor and shall be removed from the site.

B. Dispose of waste material without causing expense or damage to the Owner.

END OF SECTION 31 00 00

SECTION 31 06 20.15

CEMENT STABILIZED SAND

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cement stabilized sand.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM C 33 - Standard Specification for Concrete Aggregates (Fine Aggregate).

B. ASTM C 40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

C. ASTM C 42 - Standard Test Methods for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

D. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

E. ASTM C 123 - Standard Test Method for Lightweight Particles in Aggregate.

F. ASTM C 142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregates.

G. ASTM C 150 - Specification for Portland Cement.

H. ASTM D 558 - Standard Test Method for Moisture-Density Relations of Soil Cement-Mixtures.

I. ASTM D 1632 - Standard Practice for Making and Curing Soil-Cement Compression and Flexure Test Specimens in the Laboratory.

J. ASTM D 1633 - Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders.

K. ASTM D 2487 - Standard Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

L. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

M. ASTM D 3665 - Standard Practice for Random Sampling of Construction Materials.

N. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

1.5 Submit proposed target cement content and production data for sand-cement mixture in

accordance with requirements of Paragraph 2.03, Materials Qualifications. DESIGN REQUIREMENTS

A. Use sand-cement mixture producing minimum unconfined compressive strength of 100 pounds per square inch (psi) in 48 hours.

1. Design will be based on strength specimens molded in accordance with ASTM D 558 at moisture content within 3 percent of optimum and within 4 hours of batching.
2. Determine minimum cement content from production data and statistical history. Provide no less than 1.5 sacks of cement per ton of dry sand.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cement: Type I Portland cement conforming to ASTM C150.

B. Sand: Clean, durable sand meeting grading requirements for fine aggregates of ASTM C 33, or requirements for bank run sand of Division 2 and the following requirements:

1. Classified as SW, SP, SW-SM, SP-SM, or SM by Unified Soil Classification System of ASTM D 2487.
2. Deleterious materials:
   a. Clay lumps, ASTM C 142 - less than 0.5 percent.
   b. Lightweight pieces, ASTM C 123; less than 5.0 percent.
   c. Organic impurities, ASTM C 40, color no darker than standard color.
3. Plasticity index of 4 or less when tested in accordance with ASTM D 4318.

C. Water: Potable water, free of oils, acids, alkalies, organic matter or other deleterious substances, meeting requirements of ASTM C 94.

2.2 MIXING MATERIALS

A. Add required amount of water and mix thoroughly in pugmill-type mixer.

B. Stamp batch ticket at plant with time of loading. Reject material not placed and compacted within 4 hours after mixing.

2.3 MATERIAL QUALIFICATION

A. Determine target cement content of material as follows:

1. Obtain samples of sand-cement mixtures at production facility representing range of cement content consisting of at least three points.
2. Complete molding of samples within 4 hours after addition of water.
3. Perform strength tests (average of two specimens) at 48 hours and 7 days.
4. Perform cement content tests on each sample.
5. Perform moisture content tests on each sample.
6. Plot average 48-hour strength vs. cement content.
7. Record scale calibration date, sample date, sample time, molding time, cement feed dial settings, and silo pressure (if applicable).

B. Test raw sand for following properties at point of entry into pug-mill:

1. Gradation
2. Plasticity index
3. Organic impurities
4. Clay lumps and friable particles

5. Lightweight pieces
6. Moisture content
7. Classification

C. Present data obtained in format similar to that provided in sample data form attached to this Section.

D. The target content may be adjusted when statistical history so indicates. For determination of minimum product performance use formula: f'c% 1/2 standard deviation

PART 3 EXECUTION

3.1 PLACING

A. Place sand-cement mixture in maximum 12-inch-thick loose lifts and compact to 95 percent of maximum density as determined in accordance with ASTM D 558, unless otherwise specified. Refer to related specifications for thickness of lifts in other applications. Target moisture content during compaction is +3 percent of optimum. Perform and complete compaction of sand-cement mixture within 4 hours after addition of water to mix at plant.

B. Do not place or compact sand-cement mixture in standing or free water.

3.2 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Division 1.

B. One sample of cement stabilized sand shall be obtained for each 150 tons of material placed per day with no less than one sample per day of production. Random samples of delivered cement stabililized sand shall be taken in the field at point of delivery in accordance with ASTM 3665. Obtain three individual samples of approximately 12 to 15 lb each from the first, middle, and last third of the truck and composite them into one sample for test purpose.

C. Prepare and mold four specimens (for each sample obtained) in accordance with ASTM D 558, Method A, without adjusting moisture content. Samples will be molded at approximately same time material is being used, but no later than 4 hours after water is added to mix.

D. After molding, specimens will be removed from molds and cured in accordance with ASTM D 1632.

E. Specimens will be tested for compressive strength in accordance with ASTM D 1633, Method A. Two specimens will be tested at 48 hours plus or minus 2 hours and two specimens will be tested at 7 days plus or minus 4 hours.

F. A strength test will be average of strengths of two specimens molded from same sample of material and tested at same age. Average daily strength will be average of strengths of all specimens molded during one day's production and tested at same age.

G. Precision and Bias: Test results shall meet recommended guideline for precision in ASTM D 1633 Section 9.

H. Reporting: Test reports shall contain, as a minimum, the following information:

1. Supplier and plant number
2. Time material was batched
3. Time material was sampled
4. Test age (exact hours)
5. Average 48-hour strength
6. Average 7-day strength

7. Specification section number
8. Indication of compliance / non-compliance
9. Mixture identification 3
10. Truck and ticket numbers
11. The time of molding
12. Moisture content at time of molding
13. Required strength
14. Test method designations
15. Compressive strength data as required by ASTM D 1633
16. Supplier mixture identification
17. Specimen diameter and height, in.
18. Specimen cross-sectional area, sq. in.

3.3 ACCEPTANCE

A. Strength level of material will be considered satisfactory if:

1. The average 48-hour strength is greater than 100 psi with no individual strength test below 70 psi.
2. All 7-day individual strength tests (average of two specimens) are greater than or equal to 100 psi.

B. Material will be considered deficient when 7-day individual strength test (average of two specimens) is less than 100 psi but greater than 70 psi. See Paragraph 3.04 Adjustment for Deficient Strength.

C. The material will be considered unacceptable and subject to removal and replacement at Contractor's expense when individual strength test (average of two specimens) has 7-day strength less than 70 psi.

D. When moving average of three daily 48-hour averages falls below 100 psi, discontinue shipment to project until plant is capable of producing material, which exceeds 100 psi at 48 hours. Five 48-hour strength tests shall be made in this determination with no individual strength tests less than 100 psi.

E. Testing laboratory shall notify Contractor, Owner's Representative, and material supplier by facsimile of tests indicating results falling below specified strength requirements within 24 hours.

F. If any strength test of laboratory cured specimens falls below the specified strength, Contractor may, at his own expense, request test of cores drilled from the area in question in accordance with ASTM C42. In such cases, three (3) cores shall be taken for each strength test that falls below the values given in 3.03.A.

G. Cement stabilized sand in an area represented by core tests shall be considered satisfactory if the average of three (3) cores is equal to at least 100 psi and if no single core is less than 70 psi. Additional testing of cores extracted from locations represented by erratic core strength results will be permitted.

3.4 ADJUSTMENT FOR DEFICIENT STRENGTH

A. When mixture produces 7-day compressive strength greater than or equal to 100 psi, then material will be considered satisfactory and bid price will be paid in full.

B. When mixture produces 7-day compressive strength less than 100 psi and greater than or equal to 70 psi, material shall be accepted contingent on credit in payment. Compute credit by the following formula: Credit per Cubic Yard = $30.00 x 2 (100 psi - Actual psi) 100

C. When mixture produces 7-day compressive strength less than 70 pounds per square inch, then

remove and replace cement-sand mixture and paving and other necessary work at no cost to Owner.

END OF SECTION 31 06 20.15

SECTION 31 06 20.17

UTILITY BACKFILL MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Material Classifications.

B. Utility Backfill Materials:

1. Concrete sand
2. Gem sand
3. Pea gravel
4. Crushed stone
5. Crushed concrete
6. Bank run sand
7. Select backfill
8. Random backfill

C. Material Handling and Quality Control Requirements.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 DEFINITIONS

A. Unsuitable Material:

1. Materials classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.
2. Materials that cannot be compacted to required density due to gradation, plasticity, or moisture content.
3. Materials containing large clods, aggregates, or stones greater than 4 inches in any dimension; debris, vegetation, or waste; or any other deleterious materials.
4. Materials contaminated with hydrocarbons or other chemical contaminants.

B. Suitable Material:

1. Materials meeting specification requirements.
2. Unsuitable materials meeting specification requirements for suitable soils after treatment with lime or cement.

C. Foundation Backfill Materials: Natural soil or manufactured aggregate meeting Class I requirements and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill where needed to provide stable support for structure foundation base. Foundation backfill materials may include concrete fill and seal slabs.

D. Foundation Base: Crushed stone aggregate with filter fabric as required, cement stabilized sand, or concrete seal slab. Foundation base provides smooth, level working surface for construction of concrete foundation.

E. Backfill Material: Classified soil material meeting specified quality requirements for designated application as embedment or trench zone backfill.

F. Embedment Material: Soil material placed under controlled conditions within embedment zone

extending vertically upward from top of foundation to an elevation 12 inches above top of pipe, and including pipe bedding, haunching and initial backfill.

G. Trench Zone Backfill: Classified soil material meeting specified quality requirements and placed under controlled conditions in trench zone from top of embedment zone to base course in paved areas or to surface grading material in unpaved areas.

H. Foundation: Either suitable soil of trench bottom or material placed as backfill of over-excavation for removal and replacement of unsuitable or otherwise unstable soils.

I. Source: Source selected by Contractor for supply of embedment or trench zone backfill material. Selected source may be project excavation, off-site borrow pits, commercial borrow pits, or sand and aggregate production or manufacturing plants.

J. Refer to Division 33 for other definitions regarding utility installation by trench construction.

1.4 REFERENCES

A. ASTM C 33 - Standard Specification for Concrete Aggregate.

B. ASTM C 40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

C. ASTM C 123 - Standard Test Method for Lightweight Particles in Aggregate.

D. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in Los Angeles Machine.

E. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

F. ASTM C 142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregates.

G. ASTM D 1140 - Standard Test Method for Amount of Material in Soils Finer Than No. 200 Sieve.

H. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

I. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

J. ASTM D 4643 - Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Method.

K. TxDOT Tex-110-E - Determining Particle Size Analysis of Soils.

L. TxDOT Tex-460-A - Material Finer Than 75 Fm (No.200) Sieve In Mineral Aggregates (Decantation Test for Concrete Aggregates).

1.5 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit description of source, material classification and product description, production method, and application of backfill materials.

C. Submit test results for samples of off-site backfill materials. Comply with Paragraph 2.03, Material Testing.

D. Before stockpiling materials, submit copy of approval from landowner for stockpiling backfill material on private property.

E. Provide delivery ticket which includes source location for each delivery of material that is obtained from off-site sources or is being paid as specific bid item.

1.6 TESTS

A. Perform tests of sources for backfill material in accordance with Paragraph 2.03B.

B. Verification tests of backfill materials may be performed by Owner in accordance with Division 1.

PART 2 PRODUCTS

2.1 MATERIAL CLASSIFICATIONS

A. Classify materials for backfill for purpose of quality control in accordance with Unified Soil Classification Symbols as defined in ASTM D 2487. Material use and application is defined in utility installation specifications and Drawings either by class, as described in Paragraph 2.01B, or by product descriptions, as given in Paragraph 2.02.

B. Class Designations Based on Laboratory Testing:

1. Class I: Well-graded gravels and sands, gravel-sand mixtures, crushed well-graded rock, little or no fines (GW, SW):
   a. Plasticity index: non-plastic.
   b. Gradation: D60/D10 - greater than 4 percent; amount passing No. 200 sieve - less than or equal to 5 percent.
2. Class II: Poorly graded gravels and sands, silty gravels and sands, little to moderate fines (GM, GP, SP, SM):
   a. Plasticity index: non-plastic to 4.
   b. Gradations:
      1) Gradation (GP, SP): amount passing No. 200 sieve - less than 5 percent.
      2) Gradation (GM, SM): amount passing No. 200 sieve - between 12 percent and 50 percent.
      3) Borderline gradations with dual classifications (e.g., SP-SM): amount passing No. 200 sieve - between 5 percent and 12 percent.
3. Class III: Clayey gravels and sands, poorly graded mixtures of gravel, sand, silt, and clay (GC, SC, and dual classifications, e.g., SP-SC):
   a. Plasticity index: greater than 7.
   b. Gradation: amount passing No. 200 sieve - between 12 percent and 50 percent.
4. Class IVA: Lean clays (CL).
   a. Plasticity Indexes:
      1) Plasticity index: greater than 7, and above A line.
      2) Borderline plasticity with dual classifications (CL-ML): PI between 4 and 7.
   b. Liquid limit: less than 50.
   c. Gradation: amount passing No. 200 sieve - greater than 50 percent.
   d. Inorganic.
5. Class IVB: Fat clays (CH)
   a. Plasticity index: above A line.
   b. Liquid limit: 50 or greater.
   c. Gradation: amount passing No. 200 sieve - greater than 50 percent.
   d. Inorganic.
6. Use soils with dual class designation according to ASTM D 2487, and which are not defined above, according to more restrictive class.

2.2 PRODUCT DESCRIPTIONS

A. Soils classified as silt (ML) silty clay (CL-ML with PI of 4 to 7), elastic silt (MH), organic clay and organic silt (OL, OH), and organic matter (PT) are not acceptable as backfill materials. These soils may be used for site grading and restoration in unimproved areas as approved by Owner's Representative. Soils in Class IVB, fat clay (CH) may be used as backfill materials where allowed by applicable backfill installation specification. Refer to Division 31.

B. Provide backfill material that is free of stones greater than 6 inches, free of roots, waste, debris, trash, organic material, unstable material, non-soil matter, hydrocarbon or other contamination, conforming to following limits for deleterious materials:

1. Clay lumps: Less than 0.5 percent for Class I, and less than 2.0 percent for Class II, when tested in accordance with ASTM C 142.
2. Lightweight pieces: Less than 5 percent when tested in accordance with ASTM C 123.
3. Organic impurities: No color darker than standard color when tested in accordance with ASTM C 40.

C. Manufactured materials, such as crushed concrete, may be substituted for natural soil or rock products where indicated in product specification, and approved by Owner's Representative, provided that physical property criteria are determined to be satisfactory by testing.

D. Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by Unified Soil Classification System (ASTM D 2487) meeting following requirements:

1. Less than 15 percent passing number 200 sieve when tested in accordance with ASTM D 1140. Amount of clay lumps or balls may not exceed 2 percent.
2. Material passing number 40 sieve shall meet the following requirements when tested in accordance with ASTM D 4318: Plasticity index: not exceeding 7.

E. Concrete Sand: Natural sand, manufactured sand, or combination of natural and manufactured sand conforming to requirements of ASTM C 33 and graded within following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

F. Gem Sand: Sand conforming to requirements of ASTM C 33 for course aggregates specified for number 8 size and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	95 to 100
No. 4	60 to 80
No. 8	15 to 40

G. Pea Gravel: Durable particles composed of small, smooth, rounded stones or pebbles and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
1/2"	100
3/8"	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

H. Crushed Aggregates: Crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

1. Materials of one product delivered for same construction activity from single source, unless otherwise approved by Owner's Representative.
2. Non-plastic fines.
3. Los Angeles abrasion test wear not exceeding 45 percent when tested in accordance with ASTM C 131.
4. Crushed aggregate shall have minimum of 90 percent of particles retained on No. 4 sieve with 2 or more crushed faces as determined by Tex-460-A, Part I.
5. Crushed stone: Produced from oversize plant processed stone or gravel, sized by crushing to predominantly angular particles from naturally occurring single source. Uncrushed gravel is not acceptable materials for embedment where crushed stone is shown on applicable utility embedment drawing details.
6. Crushed Concrete: Crushed concrete is an acceptable substitute for crushed stone as utility backfill. Gradation and quality control test requirements are same as crushed stone. Provide crushed concrete produced from normal weight concrete of uniform quality; containing particles of aggregate and cement material, free from other substances such as asphalt, reinforcing steel fragments, soil, waste gypsum (calcium sulfate), or debris.

7. Gradations, as determined in accordance with Tex-110-E.

Sieve	Percent Passing by Weight for Pipe Embedment By Ranges of Nominal Pipes Sizes		
	>15"	15" – 8"	< 8"
1"	95 – 100	100	--
¾"	60 – 90	90 – 100	100
½"	25 – 60	--	90 – 100
3/8"	--	20 – 55	40 – 70
No. 4	0 – 5	0 – 10	0 – 15
No. 8	--	0 – 5	0 – 5

I. Select Backfill: Class III clayey gravel or sand or Class IV lean clay with plasticity index between 7 and 20 or clayey soils treated with lime in accordance with Division 31 to meet plasticity criteria.

J. Random Backfill: Any suitable soil or mixture of soils within Classes I, II, III and IV; or fat clay (CH) where allowed by applicable backfill installation specification. Refer to Division 31.

K. Cement Stabilized Sand: Conform to requirements of Division 31.

L. Concrete Backfill: Conform to Class B concrete as specified in Division 32.

M. Flexible Base Course Material: Conform to requirements of applicable portions of Division 33.

2.3 MATERIAL TESTING

A. Source Qualification. Perform testing to obtain tests by suppliers for selection of material sources and products not from the project site. Test samples of processed materials from current production representing material to be delivered. Use tests to verify that materials meet specification requirements. Repeat qualification test procedures each time source characteristics change or there is planned change in source location or supplier. Include the following qualification tests, as applicable:

1. Gradation. Report complete sieve analyses regardless of specified control sieves from largest particle through No. 200 sieve.
2. Plasticity of material passing No. 40 sieve.
3. Los Angeles abrasion wear of material retained on No. 4 sieve.
4. Clay lumps.
5. Lightweight pieces.
6. Organic impurities.

B. Production Testing. Provide reports to Owner's Representative from an independent testing

laboratory that backfill materials to be placed in Work meet applicable specification requirements.

C. Assist Owner's Representative in obtaining material samples for verification testing at source or at production plant.

PART 3 EXECUTION

3.1 SOURCES

A. Use of existing material in trench excavations is acceptable, provided applicable specification requirements are satisfied.

B. Identify off-site sources for backfill materials at least 14 days ahead of intended use so that Owner's Representative may obtain samples for verification testing.

C. Materials may be subjected to inspection or additional verification testing after delivery. Materials which do not meet requirements of specifications will be rejected. Do not use material which, after approval, has become unsuitable for use due to segregation, mixing with other materials, or by contamination. Once material is approved by Owner's Representative, expense for sampling and testing required to change to different material will be credited to Owner through change order.

D. Bank run sand, select backfill, and random backfill, if available in project excavation, may be obtained by selective excavation and acceptance testing. Obtain additional quantities of these materials and other materials required to complete work from off-site sources.

E. Owner does not represent or guarantee that any soil found in excavation work will be suitable and acceptable as backfill material.

3.2 MATERIAL HANDLING

A. When backfill material is obtained from either commercial or non-commercial borrow pit, open pit to expose vertical faces of various strata for identification and selection of approved material to be used. Excavate selected material by vertical cuts extending through exposed strata to achieve uniformity in product.

B. Establish temporary stockpile locations for practical material handling, control, and verification testing by Owner's Representative in advance of final placement. Obtain approval from landowner for storage of backfill material on adjacent private property.

C. When stockpiling backfill material near project site, use appropriate covers to eliminate blowing of materials into adjacent areas and prevent runoff containing sediments from entering drainage system.

D. Place stockpiles in layers to avoid segregation of processed materials. Load material by making successive vertical cuts through entire depth of stockpile.

3.3 FIELD QUALITY CONTROL

A. Quality Control

1. The Owner's Representative may sample and test backfill at:
   a. Sources including borrow pits, production plants and Contractor's designated off-site stockpiles.
   b. On-site stockpiles.
   c. Materials placed in Work.

2. The Owner's Representative may re-sample material at any stage of work or location if changes in characteristics are apparent.

B. Production Verification Testing: Owner's testing laboratory will provide verification testing on backfill materials, as directed by Owner’s Representative. Samples may be taken at source or at production plant, as applicable.

END OF SECTION 31 06 20.17

SECTION 31 11 00

SITE CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removing surface debris and rubbish.

B. Clearing site of plant life and grass.

C. Removing trees and shrubs.

D. Removing root system of trees and shrubs.

E. Fence removal.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate clearing work with utility companies.

PART 2 PRODUCTS - Not Used PART

3 EXECUTION

3.1 PREPARATION

A. Verify that existing plant life and features designated to remain are identified and tagged.

3.2 PROTECTION

A. Protect following from damage or displacement:
   1. Living trees located 3 feet or more outside of intersection of side slopes and original ground line.
   2. Plants other than trees and landscape features designated to remain.
   3. Utilities designated to remain.
   4. Bench marks, monuments, and existing structures designated to remain.

3.3 CLEARING

A. Remove stumps, main root ball, and root system to:

   1. Depth of 24 inches below finished subgrade elevation in area bounded by lines two feet behind back of curbs.
   2. Depth of 24 inches below finished surface of required cross section for other areas.

B. Clear undergrowth and deadwood without disturbing subsoil.

C. Remove vegetation from topsoil scheduled for reuse.

3.4 REMOVAL

A. Remove debris, rubbish, and extracted plant material life from site in accordance with requirements of Division 1.

B. Remove on site fences. Materials generated from removal of fences become property of Contractor. Properly dispose of in accordance with applicable local, state and federal laws.

END OF SECTION 31 11 00

SECTION 31 22 00

SITE GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures, building pads, and play fields.

C. Replacement of topsoil and finish grading for planting.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 PROJECT CONDITIONS

A. Protect above- and below-grade utilities thatremain.

B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

C. Protect bench marks survey, control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil - Soil Type : Topsoil excavatedon-site.
   1. Graded.
      a. Free of roots, rocks larger than 1/2 inch (12 mm), subsoil, debris, large weeds and foreign matter.
      b. Provide imported topsoil conforming to the requirements of Division 32 as required.
   2. Other Fill Materials: Reference relevant sections of Division 32 and the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

A. Identify required lines, leveler contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect utilities that remain, from damage.

D. Notify utility company to remove and relocate utilities.

3.3 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or degraded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Division 31 Specifications for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 SOIL REMOVAL

A. Stockpile excavated topsoil on site.

B. Stockpile excavated subsoil on site.

C. Stockpiles: Use areas designated on site, pile depth not to exceed 8 feet (2.5 m); protect from erosion.

3.5 FINISH GRADING

A. Before Finish Grading:
1. Verify building and trench backfilling have been inspected.
2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove/Break-up soil clumps greater than 1” in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches (75 mm).

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).

E. Place topsoil in areas where seeding is indicated.

F. Place topsoil where required to level finish grade.

G. Place topsoil to the following compacted thicknesses:

1. Areas to be Seeded with Grass: 6 inches (150 mm).
2. Areas to be Sodded: 4 inches (100 mm).

H. Place topsoil during dry weather.

I. Remove roots, weeds, rocks, and foreign material while spreading.

J. Near plants spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

L. Lightly compact placed topsoil.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot (30 mm) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 1/2 inch (13 mm).

3.7 FIELD QUALITY CONTROL

A. See Division 1 and Division 31 for compaction density testing.

3.8 CLEANING AND PROTECTION

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water. Excess topsoil and subsoil to be removed at no additional cost to owner.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 31 22 00

SECTION 31 23 13

BUILDING SUBGRADE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Excavating, filling, backfilling, grading, and compacting of earth at the building site.
   1. Building foundation shall consist of:
      a. Pier and beam construction with concrete floor system on select fill.

B. Related Sections:
   1. Section 01 45 23 - Testing and Inspection Services.
   2. Section 07 13 23 - Self-adhering Sheet Waterproofing.
   3. Section 31 10 00 - Site Clearing.
   4. Section 31 23 00 - Earthwork; Site related earthwork.
   5. Section 31 23 33 - Trenching and Backfilling.
   6. Section 31 63 29 - Drilled Concrete Piers.

1.2 SUBMITTALS

A. Samples: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit a one gallon sample and material analysis results of imported topsoil from a testing laboratory indicating compliance with these specifications. Any topsoil delivered to the site which does not comply with the approved sample shall be re-tested at the Contractor's expense and replaced.

B. Test Reports:
   1. Submit copies of test reports in accordance with SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.
   2. Submit copies of test reports for select fill material. No select fill material shall be delivered to the site until after the tests have been made and test reports confirmed.
   3. Compaction Tests: Submit copies of compaction test reports.

1.3 QUALITY ASSURANCE

A. Laboratory Control: Select fill material and imported topsoil, if required, shall be inspected and tested by an independent testing laboratory.
   1. Testing laboratory shall make tests of the soil from the selected source to determine that it meets the specified requirements for select fill and imported topsoil.

1.4 PROJECT CONDITIONS

A. Temporary Sheeting: Shore and sheet excavations to protect utilities and to prevent cave-in. Maintain sheeting secure until permanent construction is in place. Remove sheeting as excavations are backfilled.

B. Drainage: Provide for adequate surface drainage during construction to keep the site free of surface water without creating a nuisance in adjacent areas.

C. Pumping: Keep the excavations free of water at all times by pumping or other means. This shall be the responsibility of the Contractor regardless of the cause, source, or nature of the water.

D. Protection:
   1. Property: Protect adjoining property, including improvements outside the limits of the work. Protect walks, curbs, and paving from damage by heavy equipment and trucks.

2. Trees: Protect tops, trunks, and roots of trees on the site which are to remain. Box or fence trees vulnerable to damage during construction. Remove interfering branches with care and cover scars with tree paint. Do not permit fires, storage of materials or excavation within the branch spread of trees to remain.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. See Structural General Notes for select fill requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove grass, weeds, roots and other vegetation from areas to be excavated, filled and graded. Fill stump holes and like small excavations with suitable material placed in lifts and thoroughly tamped.

B. Scarify the subgrade soil in place to a depth of 6" and compact to a minimum of 95% of Standard Density, at 1 or more percentage points above optimum moisture content, in accordance with ASTM D 698.

3.2 EXCAVATION

A. General: Excavate to the lines, grades and sections shown on the drawings. Allow space for the construction of forms. Excavate as required regardless of the condition or type of material encountered.
   1. Cut areas accurately to the indicated cross-sections and grades. Take care to prevent excavation below the grades indicated. Any bottoms and slopes that are undercut shall be backfilled with earth fill and compacted.

B. **Excavation for Select Fill: Under those areas of the building to have concrete floor slab on grade (not suspended), over-excavate and remove the existing soil to a depth of [5 feet] below the bottom of the building floor slab. This over-excavation shall extend to 5 ft beyond the building perimeter.**

3.3 WASTING

A. Surplus excavated material not suitable or required for embankment fill and backfill shall be wasted off site.

3.4 FILL AND BACKFILL

A. Filling: Construct compacted fills to the lines, grades and sections shown on the drawings.
   1. Complete stripping and wasting operations in advance of fill construction.
   2. Deposit and mix fill material in loose lifts less than **8" thick**, loose measurement. Manipulate each layer until the material is uniformly mixed and pulverized.
   3. Fill material shall have a moisture content at or slightly above optimum, to achieve specified compaction. If fill is too wet, dry by aeration to achieve desired moisture content. If fill is too dry, add water and mix in by blading and discing to achieve desired moisture content.
   4. Exercise care to prevent movement or breakage or walls, trenches, and pipe during filling and compaction. Place fill near such items by means of light equipment and tamp with pneumatic or hand tampers.

B. Backfilling: Construct compacted fill against and around concrete beams below finish grade.
   1. Do not backfill until underground construction has been inspected, tested and approved, forms removed, and the excavations cleaned of trash and debris.
   2. Do not backfill against beams until all of the permanent structural concrete supports and bracing members are in place or until adequate shoring has been erected to prevent displacement and deflection of the beams under horizontal load. Exercise care in the placing and compacting of backfill so as not to damage the structure in any way.
   3. Provide “Select Earth Fill; perimeter grade beam” at backfill for grade beams and footings. Unless noted otherwise, concrete walls extending five feet or more below the outside grade shall be backfilled with sand to within two feet of finish grade. The top two feet of backfill against these walls shall be “Select Earth Fill; perimeter grade beam”.

4. Bring backfill to required grades by depositing material in horizontal layers not more than **8" deep**, loose measurement.
5. If subgrade membrane waterproofing over concrete is installed, the Architect shall inspect the waterproofing before any backfill is placed. Do not puncture or otherwise damage the waterproofing while backfilling.

3.5 COMPACTION

A. Compact each layer of earth fill and backfill thoroughly and evenly until there is no evidence of further compaction and a solid and uniform density is secured.
   1. Equipment for compacting shall be sheepsfoot and rubber tired rollers or other compactors capable of obtaining the required density. Compact the fill with power tampers and by hand in areas not accessible to rollers.
   2. Compact each layer of fill to the density listed below as a function of the location. The required density in each case is indicated as a percentage of the maximum dry unit weight determined using the standard compaction test ASTM D 698.
   3. Compact fill at to the density listed below at a moisture content between optimum and withing -1 to +3% of optimum value.
      a. Material adjacent to grade beams

3.6 GRADING

A. Grading Under Slabs:
   1. Grading Under Slabs On Grade: Shape and finish select earth fill to form the subgrade for concrete floor slabs on grade. Fine grade the areas to the proper elevations and leave the compacted surfaces smooth, without waves and ruts.

3.7 FIELD QUALITY CONTROL

A. Compaction Tests: Field density testing of the select fill material under the building and paving and at perimeter grade beam shall be performed by an Independent Testing Laboratory.

B. Testing laboratory shall make one in place density test for each 5000 sq. ft. of area per lift, but in no case less than two tests, and one test per 100 linear feet of backfill area adjacent to grade beams, to insure that the specified density is obtained.

END OF SECTION

---THIS PAGE INTENTIONALLY BLANK ---

SECTION 31 23 16.14

TRENCH SAFETY SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Trench Safety System for the construction of trench excavations.

B. Trench Safety System for structural excavations that fall under provisions of State and Federal trench safety laws.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). The Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 DEFINITIONS

A. A trench shall be defined as a narrow excavation (in relation to its depth) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet.

B. The Trench Safety System requirements will apply to larger open excavations if the erection of structures or other installations limits the space between the excavation slope and the installation to dimensions equivalent of a trench as defined.

C. Trench Safety Systems include but are not limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage.

1.4 SUBMITTALS

A. Submittals shall conform to requirements of Division 1.

B. Submit a safety program specifically for the construction of trench excavation. Design the Trench Safety Program to be in accordance with OSHA 29 CFR standards governing the presence and activities of individuals working in and around trench excavations.

C. Construction and shop drawings containing deviations from OSHA standards or special designs shall be sealed by a licensed Engineer retained and paid by Contractor.

D. Review of the safety program by the Engineer will only be in regard to compliance with this specification and will not constitute approval by the Engineer nor relieve Contractor of obligations under State and Federal trench safety laws.

1.5 REGULATORY REQUIREMENTS

A. Install and maintain Trench Safety Systems in accordance with the detail specifications set out in the provision of Excavations, Trenching, and Shoring, Federal Occupation Safety and Health Administration (OSHA) Standards, 29 CFR, Part 1926, Subpart P, as amended, including Final Rule, published in the Federal Register Vol. 54, No. 209 on Tuesday, October 31, 1989. The sections that are incorporated into these specifications by reference include Sections 1926-650 through 1926-652.

B. The Contractor is responsible for obtaining a copy of OSHA standards included in "Subpart P - Excavations" from the Federal Register Vol. 54, No. 209.

C. Legislation that has been enacted by the Texas Legislature with regard to trench safety systems is hereby incorporated, by reference, into these specifications. Refer to Texas Health and Safety Code Ann., § 756.021 (Vernon 1991).

D. Reference materials, if developed for a specific project, will be issued with the Bid Documents.

1.6 INDEMNIFICATION

A. Contractor shall indemnify and hold harmless the Owner, its employees and agents, from any and all damages, costs (including, without limitation, legal fees, court costs, and the cost of investigation), judgements or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this Contract.

B. Contractor acknowledges and agrees that this indemnity provision provides indemnity for the Owner in case the Owner is negligent either by act or omission in providing for trench safety, including, but not limited to safety program and design reviews, inspections, failures to issue stop work orders, and the hiring of the Contractor.

PART 2 PRODUCTS – Not Used PART 3

EXECUTION

3.1 INSTALLATION

A. Install and maintain Trench Safety Systems in accordance with provisions of OSHA 29 CFR.

B. Install specially designed Trench Safety Systems in accordance with the Contractor's trench excavation safety program for the locations and conditions identified in the program.

C. A competent person, as identified in the Contractor's trench safety program, shall verify that trench boxes and other premanufactured systems are certified for the actual installation conditions.

3.2 INSPECTION

A. Contractor, or Contractor's independently retained consultant, shall make daily inspections of the Trench Safety Systems to ensure that the installed systems and operations meet OSHA 29 CFR and other personnel protection regulations requirements.

B. If evidence of possible cave-ins or slides is apparent, Contractor shall immediately stop work in the trench and move personnel to safe locations until necessary precautions have been taken by Contractor to safeguard personnel entering the trench.

C. Maintain a permanent record of daily inspections.

3.3 FIELD QUALITY CONTROL

A. Contractor shall verify specific applicability of the selected or specially designed Trench Safety Systems to each field condition encountered on the project.

END OF SECTION 31 23 16.14

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavation, trenching, foundation, embedment, and backfill for installation of utilities, including manholes and other pipeline structures.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 DEFINITIONS

A. Pipe Foundation: Suitable and stable native soils that are exposed at trench subgrade after excavation to depth of bottom of bedding as shown on Drawings, or foundation backfill material placed and compacted in over-excavations.

B. Pipe Bedding: Portion of trench backfill that extends vertically from top of foundation up to level line at bottom of pipe, and horizontally from one trench sidewall to opposite sidewall.

C. Haunching: Material placed on either side of pipe from top of bedding up to springline of pipe and horizontally from one trench sidewall to opposite sidewall.

D. Initial Backfill: Portion of trench backfill that extends vertically from springline of pipe (top of haunching) up to level line 12 inches above top of pipe, and horizontally from one trench sidewall to opposite sidewall.

E. Pipe Embedment: Portion of trench backfill that consists of bedding, haunching and initial backfill.

F. Trench Zone: Portion of trench backfill that extends vertically from top of pipe embedment up to pavement subgrade or up to final grade when not beneath pavement.

G. Unsuitable Material: Unsuitable soil materials are the following:

1. Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.
2. Materials that cannot be compacted to required density due to gradation, plasticity, or moisture content.
3. Materials that contain large clods, aggregates, stones greater than 4 inches in any dimension, debris, vegetation, waste or any other deleterious materials.
4. Materials that are contaminated with hydrocarbons or other chemical contaminants.

H. Suitable Material: Suitable soil materials are those meeting specification requirements. Materials mixed with lime or cement that can be compacted to required density and meeting requirements for suitable materials may be considered suitable materials, unless otherwise indicated.

I. Backfill: Suitable material meeting specified quality requirements placed and compacted under controlled conditions.

J. Ground Water Control Systems: Installations external to trench, such as well points, eductors, or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of trench excavation, and depressurization to prevent failure or heaving of excavation bottom. Refer to Division 1.

K. Surface Water Control: Diversion and drainage of surface water runoff and rain water away from trench excavation. Rain water and surface water accidentally entering trench shall be controlled and removed as part of excavation drainage.

L. Excavation Drainage: Removal of surface and seepage water in trench by sump pumping and using drainage layer, as defined in ASTM D 2321, placed on foundation beneath pipe bedding or thickened bedding layer of Class I material.

M. Trench Conditions are defined with regard to stability of trench bottom and trench walls of pipe embedment zone. Maintain trench conditions that provide for effective placement and compaction of embedment material directly on or against undisturbed soils or foundation backfill, except where structural trench support is necessary.

1. Dry Stable Trench: Stable and substantially dry trench conditions exist in pipe embedment zone as result of typically dry soils or achieved by ground water control (dewatering or depressurization) for trenches extending below ground water level.
2. Stable Trench with Seepage: Stable trench in which ground water seepage is controlled by excavation drainage.
    a. Stable Trench with Seepage in Clayey Soils: Excavation drainage is provided in lieu of or to supplement ground water control systems to control seepage and provide stable trench subgrade in predominately clayey soils prior to bedding placement.
    b. Stable Wet Trench in Sandy Soils: Excavation drainage is provided in embedment zone in combination with ground water control in predominately sandy or silty soils.
    c. Unstable Trench: Unstable trench conditions exist in pipe embedment zone if ground water inflow or high water content causes soil disturbances, such as sloughing, sliding, boiling, heaving or loss of density.

N. Sub-trench: Sub-trench is special case of benched excavation. Sub-trench excavation below trench shields or shoring installations may be used to allow placement and compaction of foundation or embedment materials directly against undisturbed soils. Depth of sub-trench depends upon trench stability and safety as determined by Contractor.

O. Trench Dam: Placement of low permeability material in pipe embedment zone or foundation to prohibit ground water flow along trench.

P. Over-excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below top of foundation as shown on Drawings, and backfilled with foundation backfill material.

Q. Foundation Backfill Materials: Natural soil or manufactured aggregate of controlled gradation, and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill to provide stable support for bedding. Foundation backfill materials may include concrete seal slabs.

R. Trench Safety Systems include both protective systems and shoring systems as defined in Division 31.

S. Trench Shield (Trench Box): Portable worker safety structure moved along trench as work proceeds, used as protective system and designed to withstand forces imposed on it by cave-in, thereby protecting persons within trench. Trench shields may be stacked if so designed or placed in series depending on depth and length of excavation to be protected.

T. Shoring System: Structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins, or to prevent movement of ground affecting adjacent installations or improvements.

U. Special Shoring: Shoring system meeting special shoring as specified in Paragraph 1.08, Special Shoring Design Requirements, for locations identified on Drawings.

1.4 REFERENCES

A. ASTM C 12 - Standard Practice for Installing Vitrified Clay Pipe Lines.

B. ASTM D 558 - Standard Test Methods for Moisture-Density Relations of Soil Cement Mixtures.

C. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft).

D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand- Cone Method.

E. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

F. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes.

G. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

H. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

I. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

J. TxDOT Tex-101-E - Preparing Soil and Flexible Base Materials for Testing.

K. TxDOT Tex-110-E - Particle Size Analysis of Soils.

L. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

1.5 SCHEDULING

A. Schedule work so that pipe embedment can be completed on same day that acceptable foundation has been achieved for each section of pipe installation, manhole, or other structures.

1.6 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit planned typical method of excavation, backfill placement and compaction including:

1. Trench widths.
2. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction.
3. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.

C. Submit backfill material sources and product quality information in accordance with requirements of Division 31.

D. Submit trench excavation safety program in accordance with requirements of Division 31. Include designs for special shoring meeting requirements defined in Paragraph 1.08, Special Shoring Design Requirements contained herein.

E. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts, and gradients.

F. Submit 11 inch by 17 inch or 12 inch by 18 inch copy of Drawing with plotted utility or

obstruction location titled "Critical Location Report" to Owner's Representative.

1.7 TESTS

A. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by Owner in accordance with requirements of Division 1 and as specified in this Section.

B. Perform backfill material source qualification testing in accordance with requirements of Division 31.

1.8 SPECIAL SHORING DESIGN REQUIREMENTS

A. Have special shoring designed or selected by Contractor's Professional Engineer to provide support for sides of excavations, including soils and hydrostatic ground water pressures as applicable, and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a pre- manufactured system selected by Contractor's Professional Engineer to meet project site requirements based on manufacturer's standard design.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Perform excavation with hydraulic excavator or other equipment suitable for achieving requirements of this Section.

B. Use only hand-operated tamping equipment until minimum cover of 12 inches is obtained over pipes, conduits, and ducts. Do not use heavy compacting equipment until adequate cover is attained to prevent damage to pipes, conduits, or ducts.

C. Use trench shields or other protective systems or shoring systems which are designed and operated to achieve placement and compaction of backfill directly against undisturbed native soil.

D. Use special shoring systems where required which may consist of braced sheeting, braced soldier piles and lagging, slide rail systems, or other systems meeting requirements as specified in Paragraph 1.08, Special Shoring Design Requirements.

2.2 MATERIAL CLASSIFICATIONS

A. Embedment and Trench Zone Backfill Materials: Conform to classifications and product descriptions of Division 31.

B. Concrete Backfill: Conform to requirements for Class B concrete as specified in Division 31.

C. Geotextile (Filter Fabric): Conform to requirements of Division 1.

D. Concrete for Trench Dams: Concrete backfill or 3 sack premixed (bag) concrete.

E. Timber Shoring Left in Place: Untreated oak.

PART 3 EXECUTION

3.1 STANDARD PRACTICE

A. Install flexible pipe, including "semi-rigid" pipe, to conform to standard practice described in ASTM D 2321, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.

B. Install rigid pipe to conform to standard practice described in ASTM C 12, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this

Section, this Section governs.

C. Classification of material will be determined by Owner's Representative.

3.2 PREPARATION

A. Establish traffic control to conform to requirements of Division 1. Maintain barricades and warning lights for streets and intersections affected by Work, and are considered hazardous to traffic movements.

B. Perform work to conform to applicable safety standards and regulations. Employ trench safety system as specified in Division 31.

C. Immediately notify agency or company owning any existing utility line which is damaged, broken, or disturbed. Obtain approval from Owner's Representative and agency for any repairs or relocations, either temporary or permanent.

D. Remove existing pavements and structures, including sidewalks and driveways, to conform to requirements of Division 2, as applicable.

E. Install and operate necessary dewatering and surface-water control measures to conform to Division 1. Provide stable trench to allow installation in accordance with Specifications.

F. Maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed in writing, replace those which are damaged or destroyed in accordance with Division 1.

3.3 CRITICAL LOCATION INVESTIGATION

A. Horizontal and vertical location of various underground lines shown on Drawings, including but not limited to water lines, gas lines, storm sewers, sanitary sewers, telecommunication lines, electric lines or power ducts, pipelines, concrete and debris, are based on best information available but are only approximate locations. At Critical Locations shown on Drawings, field verify horizontal and vertical locations of such lines within zone 2 feet vertically and 4 feet horizontally of proposed work.

1. Verify location of existing utilities minimum of 7 working days in advance of pipe laying activities based on daily pipe laying rate. Use extreme caution and care when uncovering these lines.
2. Notify Owner's Representative in writing immediately upon identification of obstruction. In event of failure to identify obstruction in minimum of 7 days, Contractor will not be entitled to extra cost for downtime including, but not limited to, payroll, equipment, overhead, demobilization and remobilization, until 7 days has passed from time Owner's Representative is notified of obstruction.

B. Notify involved utility companies of date and time that investigation excavation will occur and request that their respective utility lines be marked in field. Comply with utility or pipeline company requirements that their representative be present during excavation. Provide Owner's Representative with 48 hours notice prior to field excavation or related work.

C. Survey vertical and horizontal locations of obstructions relative to project baseline and datum and plot on 12 inch by 18 inch copy of Drawings. For large diameter water lines, submit to Owner's Representative for approval, horizontal and vertical alignment dimensions for connections to existing lines, tied into project baseline, signed and sealed by R.P.L.S.

3.4 PROTECTION

A. Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within grading limits as designated on Drawings, and in accordance with requirements of Division 1.

B. Protect and support above-grade and below-grade utilities which are to remain.

C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on Drawings.

D. Take measures to minimize erosion of trenches. Do not allow water to pond in trenches. Where slides, washouts, settlements, or areas with loss of density or pavement failures or potholes occur, repair, recompact, and pave those areas at no additional cost to the Owner.

3.5 EXCAVATION

A. Except as otherwise specified or shown on Drawings, install underground utilities in open cut trenches with vertical sides.

B. Perform excavation work so that pipe, conduit, and ducts can be installed to depths and alignments shown on Drawings. Avoid disturbing surrounding ground and existing facilities and improvements.

C. Determine trench excavation widths using following schedule as related to pipe outside diameter (O.D.).

Nominal Pipe Size, Inches	**Minimum Trench Width, Inches**
Less than 18	O.D. + 24
18 to 30	O.D. + 24
36 to 42	O.D. + 36
Greater than 42	O.D. + 48

D. Use sufficient trench width or benches above embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill, and other materials.

E. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify Owner's Representative and obtain instructions before proceeding.

F. Shoring of Trench Walls.

1. Install Special Shoring in advance of trench excavation or simultaneously with trench excavation, so that soils within full height of trench excavation walls will remain laterally supported at all times.
2. For all types of shoring, support trench walls in pipe embedment zone throughout installation. Provide trench wall supports sufficiently tight to prevent washing trench wall soil out from behind trench wall support.
3. Leave sheeting driven into or below pipe embedment zone in place to preclude loss of support of foundation and embedment materials, unless otherwise directed by Owner's Representative. Leave rangers, walers, and braces in place as long as required to support sheeting, which has been cut off, and trench wall in vicinity of pipe zone.
4. Employ special methods for maintaining integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.
5. If sheeting or other shoring is used below top of pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into embedment zone shall be equivalent of 1-inch-thick steel

plate. As sheeting is removed, fill in voids left with grouting material.

G. Use of Trench Shields. When trench shield (trench box) is used as worker safety device, the following requirements apply:

1. Make trench excavations of sufficient width to allow shield to be lifted or pulled freely, without damage to trench sidewalls.
2. Move trench shields so that pipe, and backfill materials, after placement and compaction, are not damaged nor disturbed, nor degree of compaction reduced. Re- compact after shield is moved if soil is disturbed.
3. When required, place, spread, and compact pipe foundation and bedding materials beneath shield. For backfill above bedding, lift shield as each layer of backfill is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.
4. Maintain trench shield in position to allow sampling and testing to be performed in safe manner.
5. Conform to applicable Governmentregulations.

H. Voids under or damages to paving area outside shield caused by Contractor's work will require removal of pavement, consolidation and replacement of pavement in accordance with Contract Documents. Repair damage resulting from failure to provide adequate supports. Contractor is responsible for all cost associated with the repairs.

I. Place sand or soil behind shoring or trench shield to prevent soil outside shoring from collapsing and causing voids under pavement. Immediately pack suitable material in outside voids following excavation to avoid caving of trench walls.

J. Coordinate excavation within 15 feet of pipeline with company's representative. Support pipeline with methods agreed to by pipeline company's representative. Use small, rubber- tired excavator, such as backhoe, to do exploratory excavation. Bucket that is used to dig in close proximity to pipelines shall not have teeth or shall have guard installed over teeth to approximate bucket without teeth. Excavate by hand within 1 foot of Pipeline Company’s line. Do not use larger excavation equipment than normally used to dig trench in vicinity of pipeline until pipelines have been uncovered and fully exposed. Do not place large excavation and hauling equipment directly over pipelines unless approved by Pipeline Company’s representative.

K. When, during excavation to uncover pipeline company's pipelines, screwed collar or an oxy-acetylene weld is exposed, immediately notify Owner’s Representative. Provide supports for collar or welds. Discuss with Pipeline Company’s representative and determine methods of supporting collar or weld during excavation and later backfilling operations.
When collar is exposed, request Pipeline Company to provide welder in a timely manner to weld ends of collar prior to backfilling of excavation.

3.6 HANDLING EXCAVATED MATERIALS

A. Use only excavated materials, which are suitable as defined in this Section and conforming to Division 31. Place material suitable for backfilling in stockpiles at distance from trench to prevent slides or cave-ins.

B. When required, provide additional backfill material conforming to requirements of Division 31.

C. Do not place stockpiles of excess excavated materials on streets and adjacent properties. Protect backfill material to be used on site. Maintain site conditions in accordance with Division 1. Excavate trench so that pipe is centered in trench. Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

3.7 TRENCH FOUNDATION

A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.

B. When wet soil is encountered on trench bottom and dewatering system is not required, overexcavate an additional 6 inches with approval by Owner's Representative. Place non- woven geotextile fabric and then compact 12 inches of crushed stone in one lift on top of fabric. Compact crushed stone with four passes of vibratory-type compaction equipment.

C. Perform over excavation, if directed by Owner's Representative, in accordance with Paragraph 3.07B above. Removal of unstable or unsuitable material may be required if approved by Owner's Representative:

1. Even though Contractor has not determined material to be unsuitable, or
2. If unstable trench bottom is encountered and an adequate ground water control system is installed and operating according to Division 1.

D. Place trench dams in Class I foundations in line segments longer than 100 feet between manholes and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.8 PIPE EMBEDMENT, PLACEMENT, AND COMPACTION

A. Remove loose, sloughing, caving, or otherwise unsuitable soil from bottoms and sidewalls of trenches immediately prior to placement of embedment materials.

B. Place embedment including bedding, haunching, and initial backfill as shown on Drawings.

C. For pipe installation, manually spread embedment materials around pipe to provide uniform bearing and side support when compacted. Protect flexible pipe from damage during placing of pipe zone bedding material. Perform placement and compaction directly against undisturbed soils in trench sidewalls, or against sheeting which is to remain in place.

D. Do not place trench shields or shoring within height of embedment zone unless means to maintain density of compacted embedment material are used. If moveable supports are used in embedment zone, lift supports incrementally to allow placement and compaction of material against undisturbed soil.

E. Place geotextile to prevent particle migration from in-situ soil into open-graded (Class I) embedment materials or drainage layers.

F. Do not damage coatings or wrappings of pipes during backfilling and compacting operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.

G. Place haunching material manually around pipe and compact it to provide uniform bearing and side support. If necessary, hold small-diameter or lightweight pipe in place during compaction of haunch areas and placement beside pipe with sand bags or other suitable means.

H. Place electrical conduit, if used, directly on foundation without bedding.

I. Shovel in-place and compact embedment material using pneumatic tampers in restricted areas, and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of next lift. Water tamping is not allowed.

J. For water lines construction embedment, use bank run sand, concrete sand, gem sand, pea gravel, or crushed limestone as specified in Division 31. For water lines adhere to the following subparagraph numbers 1 and 2; for utility installation other than water, adhere to numbers 3 and 4 below:

1. Class I, II and III Embedment Materials:
   a. Maximum 6 inches compacted lift thickness.
   b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.
   c. Moisture content to be within -3 percent to +5 percent of optimum as determined according to ASTM D 698, unless otherwise approved by Owner's Representative.
2. Cement Stabilized Sand (where required for special installations):

a. Maximum 6 inches compacted thickness.
b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.
c. Moisture content to be on dry side of optimum as determined according to ASTM D 698 but sufficient for effective hydration.

3. Class I Embedment Materials.
   a. Maximum 6-inches compacted lift thickness.
   b. Systematic compaction by at least two passes of vibrating equipment. Increase compaction effort as necessary to effectively embed pipe to meet deflection test criteria.
   c. Moisture content as determined by Contractor for effective compaction without softening soil of trench bottom, foundation or trench walls.
4. Class II Embedment and Cement Stabilized Sand.
   a. Maximum 6-inches compacted thickness.
   b. Compaction by methods determined by Contractor to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698 for Class II materials and according to ASTM D 558 for cement stabilized materials.
   c. Moisture content of Class II materials within 3 percent of optimum as determined according to ASTM D 698. Moisture content of cement stabilized sands on dry side of optimum as determined according to ASTM D 558 but sufficient for effective hydration.

K. Place trench dams in Class I embedment in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.9 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION

A. Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only minimum length of trench open as necessary for construction.

B. For water lines, backfill in trench zone, including auger pits, intermediate and site pits, with bank run sand, select fill, or random backfill material as specified in Division 31.

C. For sewer pipes, use backfill materials described by trench limits. For "trench zone backfill" under pavement and to within one foot back of curb, use cement stabilized sand to level 12 inches below the pavement. For sewer pipes under natural ground backfill from 12 inches

above top of pipe to 6” inches below finish grade with suitable on-site material or select backfill. Use select backfill for rigid pavements or flexible base material for asphalt pavements for 12-inch backfill directly under pavement. Use topsoil for 6-inch backfill directly under natural grade. For backfill materials reference Division 31.

D. Where damage to completed pipe installation work is likely to result from withdrawal of sheeting, leave sheeting in place. Cut off sheeting 1.5 feet or more above crown of pipe. Remove trench supports within 5 feet from ground surface.

E. When shown on Drawings, random backfill of suitable material may be used in trench zone for trench excavations outside pavements.

F. Place trench zone backfill in lifts and compact. Fully compact each lift before placement of next lift.

1. Class I, II, III or IV or combination thereof (Random Backfill):

   a. Maximum 9-inches compacted lift thickness.
   b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 698.
   c. Moisture content within zero percent to +5 percent of optimum determined according to ASTM D 698, unless otherwise approved by Owner’s Representative.

2. Cement-Stabilized Sand:
   a. Maximum lift thickness determined by Contractor to achieve uniform placement and required compaction, but do not exceed 12 inches.
   b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 558.
   c. Moisture content on dry side of optimum determined according to ASTM D 558 but sufficient for cement hydration.
3. Select Backfill:
   a. Place in maximum 8-inch loose layers.
   b. Compaction by equipment providing tamping or kneading impact to minimum of 95 percent of maximum dry density determined according to ASTM D 698.
   c. Moisture content within 2 percent below or 5 percent above optimum determined according to ASTM D 698, unless approved by Owner's Representative.

G. Unless otherwise shown on Drawings, for trench excavations not under pavement, random backfill of suitable material may be used in trench zone.

1. Fat clays (CH) may be used as trench zone backfill outside paved areas at Contractor's option. When required density is not achieved, at no additional cost to Owner, rework, dry out, use lime stabilization or other approved methods to achieve compaction requirements, or use different suitable material.
2. Maximum 9-inch compacted lift thickness for clayey soils and maximum 12-inch lift thickness for granular soils.
3. Compact to minimum of 90 percent of maximum dry density determined according to ASTM D 698.
4. Moisture content as necessary to achieve density.

H. For electric conduits, remove form work used for construction of conduits before placing trench zone backfill.

3.10 MANHOLES, INLETS, JUNCTION BOXES AND OTHER PIPELINE STRUCTURES

A. Meet requirements of adjoining utility installations for backfill of pipeline structures, as shown on Drawings.

B. Below paved areas, encapsulate structure with cement stabilized sand; minimum of 1 foot below base, minimum 2 foot around walls, up to within 12 inches of pavement subgrade. Compact in accordance with Paragraph 3.9.F.2 of this Section. Use select backfill for rigid pavements or flexible base material for asphalt pavements for 12- inch backfill directly under pavement.

C. In unpaved areas, encapsulate structure with cement stabilized sand; minimum of 1 foot below base, minimum 2 foot around walls, up to within 12 inches of finish grade. Compact in accordance with Paragraph 3.9.F.2 of this Section. Use suitable on-site material and topsoil for the 12-inch backfill directly under natural ground.

3.11 FIELD QUALITY CONTROL.

A. Test for material source qualifications as defined in Division 1.

B. Provide excavation and trench safety systems at locations and to depths required for testing and retesting during construction at no additional cost to Owner.

C. Tests will be performed on minimum of three different samples of each material type for plasticity characteristics, in accordance with ASTM D 4318, and for gradation characteristics, in accordance with Tex-101-E and Tex-110-E. Additional classification tests will be performed whenever there is noticeable change in material gradation or plasticity, or when requested by Owner's Representative.

D. At least three tests for moisture-density relationships will be performed initially for backfill materials in accordance with ASTM D 698, and for cement- stabilized sand in accordance with ASTM D 558.

Perform additional moisture-density relationship tests once a month or whenever there is noticeable change in material gradation or plasticity.

E. In-place density tests of compacted pipe foundation, embedment and trench zone backfill soil materials will be performed according to ASTM D 1556, or ASTM D 2922 and ASTM D 3017, and at following frequencies and conditions.

1. For open cut construction projects and auger pits: Unless otherwise approved by Owner's Representative, successful compaction to be measured by one test per 40 linear feet measured along pipe for compacted embedment and two tests per 40 linear feet measured along pipe for compacted trench zone backfill material. Length of auger pits to be measured to arrive at 40 linear feet.
2. A minimum of three density tests for each full shift of Work.
3. Density tests will be distributed among placement areas. Placement areas are: foundation, bedding, haunching, initial backfill and trench zone.
4. The number of tests will be increased if inspection determines that soil type or moisture content are not uniform or if compacting effort is variable and not considered sufficient to attain uniform density, as specified.
5. Density tests may be performed at various depths below fill surface by pit excavation. Material in previously placed lifts may therefore be subject to acceptance/rejection.
6. Two verification tests will be performed adjacent to in-place tests showing density less than acceptance criteria. Placement will be rejected unless both verification tests show acceptable results.
7. Recompacted placement will be retested at same frequency as first test series, including verification tests.
8. Identify elevation of test with respect to natural ground or pavement.

F. Recondition, recompact, and retest at Contractor's expense if tests indicate Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at Contractor's expense.

G. Acceptability of crushed rock compaction will be determined by inspection.

3.12 DISPOSAL OF EXCESS MATERIAL

A. Dispose of excess materials in accordance with requirements of Division 1.

END OF SECTION 31 23 33

SECTION 31 31 16

TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Soil treatment for termite control.

1.2 DEFINITIONS

A. EPA: Environmental Protection Agency.

B. IPM: Integrated Pest Management. It is the policy of the Owner to use Integrated Pest Management (IPM) as the strategy for control of termites in and around Owner's facilities.

C. PCO: Pest control operator.

D. TDA SPCS: Texas Department of Agriculture – Structural Pest Control Service

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:
1. Treatments and application instructions, including EPA-Registered Label.
2. Material Safety Data Sheets (MSDS).
3. Classification of Termiticide: Indicate as green listed, yellow listed, or red listed product as recognized by the TDA SPCS.
4. Concurrent with submission of product data to Architect, provide one copy of the submittal to Alvin ISD.
5. Proposed termiticides must be approved by the Owner prior to the start of any preparation or application.

C. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:
1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

F. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.

B. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

C. Conform with all applicable codes and ordinances including the Federal Insecticide, Fungicide, and Rodenticide Act (7 United Sates Code 136 et seq.); Owner policies and procedures; Environmental Protection Agency regulations in 40 Code of Federal Regulations; Occupational Safety and Health Administration regulations; and state and local regulations.

D. Conform with approved termiticide list criteria established by the TDA SPCS

1.5 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.6 COORDINATION

A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

C. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. Criteria established in the most recent TDA SPCS definitions of these products.
1. Green List. All products must be from the following: inorganic termiticides (i.e., boric acid, disodium octoborate tetrahydrate, silica gels, diatomaceous earth); insect growth regulators; insect baits in tamper-resistant containers or for crack and crevice placement only; microbe-based insecticides; botanical insecticides (not including synthetic pyrethroids) containing not more than 5% synergists; biological (living) control agents.
2. Yellow List. All EPA Category III and IV termiticides (i.e., products carrying a CAUTION signal word) not included in the Green List, with the exception of restricted- use or state limited-use termiticides as defined under the Federal Insecticide, Fungicide, and Rodenticide Act and/or the Texas Agricultural Code.
3. Red List. All Category I and II termiticides (i.e., products carrying a WARNING or DANGER signal word), not included in the Green List, or restricted-use termiticides, or state limited-use termiticides as defined under the Federal Insecticide, Fungicide, and Rodenticide Act and/or the Texas Agricultural Code.

2.2 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

B. Manufacturers:
1. AgrEvo Environmental Health, Inc.; a Company of Hoechst and Schering, Berlin.
2. Bayer Corp.; Garden & Professional Care, www.bayerprocentral.com.
3. DowElanco, www.dowagro.com.
4. FMC Corp.; Pest Control Specialties, www.ag.fmc.com.
5. Zeneca Professional Products, www.zeneca.com.

6. Substitutions: Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.

C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Applications shall be completed no less than seven days prior to initial occupancy of the structure, or as otherwise indicated on the termiticide label, whichever is longer.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Crawlspaces: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
4. Masonry: Treat voids.
5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions and manufacturer’s recommendations and requirements..

D. Post warning signs in areas of application as required for Commercial Treatment.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 31 16

SECTION 31 63 29

DRILLED CONCRETE PIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concrete piers, including drilling, reinforcing, casing, and placing concrete.

B. Related Documents/Sections:
1. Document 00 31 32 - Geotechnical Data.
2. Section 01 45 23 - Testing and Inspection Services.
3. Section 03 20 00 - Concrete Reinforcing.
4. Section 03 30 00 - Cast-in-Place Concrete.
5. Typical Pier Detail - refer to structural drawings.

1.2 SUBMITTALS

A. Data Reports: Independent Testing Laboratory shall log each drilled shaft by recording not less than the following information:
1. Identifying mark; use same identifying mark shown on drawings.
2. Date and time excavation started;
3. Shaft diameter as per drawings;
4. Shaft diameter as constructed;
5. Bottom of penetration as per drawings;
6. Bottom of penetration as constructed;
7. Actual elevation at initial point of drilling, i.e. top of ground (in relation to sea level);
8. Estimated bearing elevation at top of penetration as per drawings (in relation to sea level);
9. Actual elevation at top of penetration as constructed (in relation to sea level);
10. Bottom of casing (if casing is used) (in relation to sea level);
11. Comments on water conditions;
12. Date and time excavation completed;
13. Date and time concrete placed;

Note: This data report does not reduce or limit the scope of work or the recording of data as required by the testing laboratory services for fulfillment of the contract documents.

B. Complete logs at the end of each day and submit a copy to the Architect for review.

C. Reconciliation of Drilled Piers and Casings: Upon completion of the construction of the drilled piers, the contractor shall reconcile the actual costs of the drilled piers and casings against the estimated costs, based on the estimated depths and sizes of piers shown on the structural drawings, the percentage of piers estimated to require casing as described in this specification, other pertinent information given in this specification and the contractor's unit prices stated on the Bid Form, which included Extra and Credit prices for drilled piers and casings.
1. The contractor shall document the total costs of the combined reconciliations of the drilled pier depths and casing lengths for submission to the Architect in a format identical to that represented by Sample Worksheets "I" and "II" included at the end of this specification section. To obtain Total Dollar Change to Contract, refer to formula on Sample Worksheet "II".
2. Refer to Sample "III", included at the end of this specification section for Glossary of Terms used in Sample Worksheets "I" and "II".

D. Confirmation of contact with Owner's testing company.

1.3 QUALITY ASSURANCE

A. Tolerances:
1. Center line of the top of the drilled shaft shall be within 3" of the plan location.
2. Drilled shaft shall be plumb to within 1½" the first 10' plus 1% of the depth greater than 10'.

B. Prior to start of shaft drilling, Contractor shall contact Owner's testing laboratory for verification and identification of bearing strata, and required penetration of bearing strata by their geotechnical engineer.

C. Prior to start of shaft drilling, Contractor's testing laboratory shall contact Owner's geotechnical engineer for verification and identification of bearing strata, and required penetration of bearing strata.

1.4 UNIT PRICES

A. Piers: Bids shall be based on drilling to estimated bearing elevation(s) plus required penetration depth as shown on typical pier detail in the structural drawings. Bids shall state unit prices per foot inclusive of drilling, reinforcing, and concrete for depths greater or less than the estimated depths as shown on typical pier detail. Adjustment of the contract sum shall be based on the total of individual shaft depths greater or less than estimated depths multiplied by their respective applicable unit price. The reconciliation of pier shaft lengths shall be calculated as shown on the "Sample "I" Pier Depth Reconciliation Worksheet" included in this specification section.

B. Casings for Piers: Bids shall include the cost of casings for **10%** of the total number of piers in each pier diameter category (e.g. 18", 24", etc.). Contractor shall fill in unit prices on the bid form for casing “extra” costs and “credit” amounts for each category. After taking into account the total linear feet of casing required by the base bid for each category, the Contract sum shall be adjusted to reflect the net increase or decrease in the total linear feet of casing required for each category, multiplied by the applicable unit cost or credit amount. The reconciliation of pier casing lengths shall be calculated as shown on the "Sample "II" Pier Casing Length Reconciliation Worksheet" included in this specification section.

C. Penetrations shall be drilled to depths shown on structural drawings and shall be included in the contractor's bid. In recognition of the imprecise nature of the drilling process, payment for over-drilling penetrations shall be permitted for up to and including 8" beyond the depth shown on the structural drawings. Payments for overdrilling beyond 8" shall only be considered when recommended by the Independent Testing Laboratory as a result of conditions encountered in the field, on a per-hole basis and when such recommendation has been so noted on the pier log report.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcement shall meet the requirements specified in SECTION 03 20 00 - CONCRETE REINFORCING.

B. Concrete shall meet the requirements specified in SECTION 03 30 00 - CAST-IN-PLACE CONCRETE with the exception of the following slump requirements:

4" to 6" for dry shafts

6" to 8" if casings are used

C. Casing: ASTM A 252, Grade 2 or ASTM A 36.

D. Pier Sleds: Provide "Centraligner" sleds and Hijacker pier bolsters as manufactured by Pieresearch, Arlington, TX (phone 817.265.0980) or equivalent.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Drilling: Drill foundation shafts with a power auger drilling machine designed for the purpose. Locate accurately and drill to the required size and depth. **[Underream for pier bells.]** Actual depth required for piers shall be determined by an engineer from the independent testing laboratory at the project site during the pier drilling operation. The pier drilling rig shall have sufficient size and power to penetrate to the required depths.

B. Cleaning: Machine clean the bottoms of shafts of loose material and debris. De-water the shafts. Shafts shall be inspected by the testing laboratory before concrete is placed.

C. Reinforcing Steel:
1. Form a cage as a structural element to maintain its shape and proportion throughout the placing of concrete and extraction of casing.

2. Install pier sleds so that reinforcing remains in position without displacement while the concrete is placed. Sled spacing and attachment shall be in accordance with sled manufacturer's recommendations.
3. Block reinforcing steel up off the bottom at least 3" with pier bolsters and fasten in place without any contact with the sides of the shaft.

D. Placing Concrete: Place concrete in each pier shaft not later than 8-hours after drilling, **[underreaming]** and cleaning of the pier hole is completed.
1. Concrete shall be placed using a clean “tremie”. In no event shall concrete strike the sides of the excavation or the reinforcing cage. Placement by the "Free Fall" method may be implemented only at the direction of the Owner’s on-site testing laboratory.
2. Vibrate or "rod" only the top 10' of concrete. Do not vibrate concrete of 6" slump or higher.
3. Do not place concrete in intersecting walls and beams until the pier concrete is no longer plastic.

E. Casing:
1. If caving soil or flowing water is encountered, use a casing to prevent caving and to exclude water. Casing shall be temporary type, to be withdrawn as the concrete is placed.
2. If a temporary casing is used, withdraw casing as concrete is placed so that bottom of casing remains below top of concrete throughout placing operation or until top of concrete reaches stable soil free from seepage. Do not rotate casing during withdrawal.
3. The requirement for casing of piers and the quantity of casing required for each pier, if any, shall be determined by the independent testing laboratory representative at the project site during the pier drilling operation.

3.2 FIELD QUALITY CONTROL

A. Inspection and Evaluation: The Independent Testing Laboratory shall provide full-time inspection at the project site during the drilling of shafts, installation of reinforcing steel, and placing of concrete in pier shafts. Full-time inspection shall include recording and reporting the information required in this specification.

B. The cost of the full-time inspection service shall be borne by the Owner.

C. The cost of the full-time inspection service shall be borne by the Contractor.

D. All costs associated with reinspection, additional inspection or retesting required as a result of non-conforming work shall be borne by the Contractor.

3.3 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:
1. Release, revoke, alter or enlarge on requirements of contract documents.
2. Approve or accept any portion of the work.
3. Perform any duties of the Contractor.

3.4 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to work.

B. Furnish copies of product test reports as required.

C. Furnish incidental labor and facilities:
1. To provide access to work to be tested.
2. To obtain and handle samples at the Project site.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

D. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. Notify laboratory immediately if there is a change in schedule to alleviate any unnecessary trips by laboratory personnel.

E. Payment for all retesting required because of nonconforming work or materials.

END OF SECTION

SAMPLE WORKSHEET "I"
PIER DEPTH RECONCILIATION WORKSHEET

PROJECT _____ PAGE _____ OF _____

PIER DIAMETER THIS PAGE _____

		A MINUS B = C x D = E				
	PIER NO.	ESTIMATED BEARING ELEVATION	ACTUAL BEARING ELEVATION	AMOUNT DEEPER (+) OR SHALLOWER (-) THAN ESTIMATED BEARING	APPLICABLE UNIT PRICE FROM BID FORM (NOTE: EXTRA(+) OR CREDIT (-))	NET EXTRA COST OR CREDIT DUE PER PIER
1						
2						
3						
4						
5						
6						
7						
8						
9						
						TOTAL OF COLUMN "E"

SAMPLE WORKSHEET "II"

PIER CASING LENGTH RECONCILIATION WORKSHEET

PROJECT _____ PAGE _____ OF _____

PIER DIAMETER THIS PAGE _____

		F MINUS A = G				F MINUS B = H		
	PIER NO.	GROUND ELEVATION AT PIER	ESTIMATED BEARING ELEVATION	ESTIMATED CASING LENGTH		GROUND ELEVATION AT PIER	* ACTUAL BEARING ELEVATION	ACTUAL CASING LENGTH
1								
2								
3								
				SUM OF FIGURES IN COLUMN "G" x SPECIFIED BID BASIS PERCENTAGE FOR PIERS TO BE CASED = TOTAL ESTIMATED CASING LENGTH				SUM OF FIGURES IN COLUMN "H" = TOTAL ACTUAL CASING LENGTH

TOTAL ACTUAL CASING LENGTH - TOTAL ESTIMATED CASING LENGTH x APPLICABLE UNIT PRICE EXTRA(+) OR CREDIT(-) = TOTAL COST OF CASINGS

TOTAL COLUMN "E" ON WORKSHEET "I" + TOTAL COST OF CASINGS ON WORKSHEET "II" = TOTAL DOLLAR CHANGE TO CONTRACT

*

IF THE ELEVATION OF THE BOTTOM OF CASING DIFFERS FROM THE ACTUAL BEARING ELEVATION, USE BOTTOM OF CASING ELEVATION WHEN CALCULATING TOTAL ACTUAL CASINGS.

SAMPLE "III"
GLOSSARY OF TERMS USED IN SAMPLE WORKSHEETS "I" AND "II"

COLUMN "A" - ESTIMATED BEARING ELEVATION:

For bidding purposes, it is the estimated elevation shown on the typical pier detail in the structural drawings at which point pier penetration commences.

COLUMN "B" - ACTUAL BEARING ELEVATION:

Actual elevation at which the bearing material is encountered by each pier as determined in the field by the independent testing laboratory.

COLUMN "C" - AMOUNT DEEPER (+) OR SHALLOWER (-) THAN ESTIMATED BEARING ELEVATION:

The amount, in feet, the bearing material was encountered above or below the estimated bearing elevation.

COLUMN "D" - APPLICABLE UNIT PRICE FROM BID FORM, EXTRA (+) OR CREDIT (-):

The applicable Extra and/or Credit unit prices per linear foot including drilling, reinforcing and concrete shown on the successful contractor's Bid Form.

COLUMN "E" - NET EXTRA COST OR CREDIT DUE PER PIER:

Net extra cost or credit due per individual pier (exclusive of casing, if required).

COLUMN "F" - GROUND ELEVATION AT PIER:

The elevation of ground at pier at time pier is drilled.

COLUMN "G" - ESTIMATED CASING LENGTH:

The estimated total linear feet of casing required for bidding purposes.

COLUMN "H" - ACTUAL CASING LENGTH:

The actual total linear feet of casing utilized during drilling.

SECTION 32 05 19

GEOTEXTILES FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All labor, materials, services, equipment and appliances required in conjunction with or properly incidental to furnishing and installation of drainage mat and filter fabric complete, including:
   1. Drainage mat for walls below grade.
   2. Non-woven filter fabric at earth fill around granular drainage course.
   3. All other locations where "Drainage Mat" or "Filter Fabric" are indicated.

B. Related Sections:
   1. Section 03 11 00 - Concrete Forming and Accessories.
   2. Section 03 30 00 - Cast-in-Place Concrete.
   3. Section 07 13 26 - Self-adhering Sheet Waterproofing.
   4. Division 22 - Sub-soil drainage system.
   5. Section 31 23 00 - Excavation and Fill.
   6. Section 31 23 13 - Building Subgrade Preparation.

1.2 SUBMITTALS

A. General: Conform to SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
   1. Submit manufacturer's specifications to evidence compliance with these specifications. Submit manufacturer's installation instructions.
   2. Submit complete, exact and specific design data for drainage mat and filter fabric products specified.

C. Samples: Submit two 12" square samples of each product specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Filter Fabric
   1. Manufacturers: Provide one of the following:
      a. "Mirafi 140 N": Mirafi, Div. of Ten Cate Nicolon Corp., 365 South holland Drive, Pendergrass, GA 30567 (phone 214.783.3475)
      b. "Propex 451": Amoco Fabrics and Fibers Co., 260 The Bluffs, Austell, GA 30168, (phone 214.701.9833)
   2. Product/Material Performance Requirements
      a. Retention Ability (Piping Resistance)
         1) Filter fabric fiber/pore structure shall be capable of retaining a broad range of soil gradations.
         2) Particles larger than the fabric's pore size shall be retained.
         3) Filter fabric structure shall promote bridging of fine soil particles over the pores in the fabric to enable the filter fabric to retain silt and clay-sized particles that are smaller than the fabric pores.
      b. Permeability: At least ten times that of the protected soil.
      c. Clogging Resistance: Maximum allowable gradient ratio is 3.
   3. Property Values (Property/Unit/Test Method)
      a. Weight: 4.5 oz./sy: ASTM D 3776
      b. Grab Strength: 120 lbs: ASTM D 4632
      c. Grab Elongation: 50%: ASTM D 4632
      d. Trapezoid Tear Strength: 50 lbs: ASTM D 4533
      e. Mullen Burst Strength: 240 psi: ASTM D 3786
      f. Puncture Strength: 70 lbs: ASTM D 4833
      g. Permittivity: 1.5/sec ASTM D 4491
      h. Water Flow Rate: 120 gpm/sf: ASTM D 4491
      i. Apparent Opening Size (AOS): 70 U.S. Std. Sieve: ASTM D 4751

B. Drainage Mat
   1. Manufacturers: Provide one of the following:
      a. "Hydroduct 220": W.R. Grace, 1420 Century Drive, Suite 400, Carrollton, Texas 75006, (972.242.3992)
      b. "G100N": Mirafi, Div. of Ten Cate Nicolon Corp., 365 South Holland Drive, Pendergrass, GA, 30567 (phone 214.783.3475)
      c. “Flow 15-P”: Polyguard, Ennis, Texas (972-875-8421)
   2. Product/Material Description: Drainage mat shall be a composite structure consisting of:
      a. A three-dimensional, high impact-resistant, polymeric sheet.
      b. Filter fabric, securely bonded to the dimpled surface of the molded polymeric sheet to maintain a rigid surface, thus preventing intrusion of the fabric into the flow channels when backfilled. The fabric shall extend beyond the edges of the polymeric sheet (3" minimum) to provide overlap with adjacent panels and discharge pipe.
      c. Attachment Material(s): Mastic, furring strip, impaling pins, or square cap nails, as recommended by the manufacturer, and as approved, in writing, by the waterproofing manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION OF FILTER FABRIC

A. Install in exact accordance with filter fabric manufacturer's latest published requirements, instructions, specifications, and details.

B. Techniques
   1. Unroll fabric over bottom of excavation.
   2. Include sufficient width for a minimum 6" overlap.
   3. Include sufficient length to extend beyond building lines to wrap around subsoil drain piping envelope as shown.
   4. Tape seams as recommended by manufacturer.
   5. Ensure fabric continuity during granular fill placement and compaction.
   6. Fabric shall be wrapped around subsoil drain piping and granular drainage envelope and attached to drainage mat as indicated.

3.2 INSTALLATION OF DRAINAGE MAT

A. Prepare substrate surfaces to insure proper and adequate installation, in exact accordance with the contract documents and manufacturer's requirements.

B. Field measure and verify dimensions as required.

C. Protection of Adjacent Areas or Surfaces:
   1. Protect adjacent areas or surfaces from damage as a result of the work of this section.
   2. Avoid damage to waterproofing.

D. Install in exact accordance with manufacturer's latest published requirements, instructions, specifications and details.

E. Wall Installation
   1. Beginning at bottom of wall, attach the first panel to the waterproofed wall with mastic, furring strip, impaling pins or square cap nails, as approved in writing by the waterproofing membrane manufacturer.
   2. Attach the panel with the filter fabric side out, away from the wall surface.
   3. Peel or trim fabric from top of the attached panel to expose 3" of core.
   4. Overlap core of second panel 2" and interlock.
   5. Cover the joint with the fabric flap.
   6. Repeat to cover the wall surface.
   7. Shingle each course, overlapping the panels in the direction of water flow.

F. Place bottom of drain panel behind subsoil drainpipe. Peel back the bottom of fabric flap. Wrap the filter fabric from front to back completely around the pipe and tuck behind core.
   1. Cover all terminal edges with the fabric flap by tucking it behind the core. For corners and other uneven surfaces, attach the fabric flap to the wall with mastic to prevent soil intrusion behind the panels.

2. Backfill within seven days, or as specified by the Architect. Place and compact the fill material 6" above the top edge of the drainage mat.

G. Backfilling: (Refer to SECTION 31 23 13 - BUILDING SUBGRADE PREPARATION)
1. Place and compact soil directly adjacent to drainage mat using plate laboratory compactors.
2. Turn plate compactor exhaust away from the drainage mat.

3.3 ADJUSTMENT AND CLEANING

A. Repair or replace any damaged or otherwise defective materials.

B. Clean up all debris caused by the work of this section, keeping the premises clean and neat at all times.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 32 11 13.13

LIME-TREATED SUBGRADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foundation course of lime stabilized natural subgrade material.

1.2 MEASURMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM D698 - Tests for Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 5.5 lb Rammer and 12 inch Drop.

B. ASTM D1140 - Method of Test for Amount of Material in Soils Finer than the No. 200 Sieve.

C. ASTM D1556 - Density of Soil in Place by the Sand-Cone Method.

D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017 - Test Method for Moisture Content of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

G. TxDOT Tex-600-J - Lime Testing Procedure.

H. Geotechnical Engineering Soils Report.

1.4 SUBMITTALS

A. Submittals shall conform to requirements of Division 1.

B. Submit certificates stating that hydrated lime, quicklime, or commercial lime slurry complies with these specifications.

C. Submit weight tickets, certified by supplier, with each bulk delivery of lime to work site.

D. Submit manufacturer's description and characteristics for rotary speed mixer and compaction equipment for approval.

1.5 TESTS

A. Testing will be performed under provisions of Section - Testing Laboratory Services.

B. Tests and analysis of soil materials will be performed in accordance with ASTM D4318.

C. Sampling and testing of lime slurry shall be in accordance with Tex-600-J.

D. Sample mixtures of hydrated lime or quicklime in slurry form will be tested to establish

compliance withspecifications.

E. Soil will be evaluated to establish percent of hydrated lime, quicklime, or lime slurry to be applied to sub grademateriial.

F. Moisture-density relationship will be established on material sample from roadway, after stabilization with lime, in accordance with ASTM D698.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Bagged lime shall bear manufacturer's name, product identification, and certified weight. Bags varying more than 5 percent of certified weight may be rejected; average weight of 50 random bags in each shipment shall not be less than certified weight.

B. Store lime in weatherproof enclosures. Protect lime from ground dampness.

C. Quicklime can be dangerous; exercise extreme caution if used for the Work. Contractor shall become informed about recommended precautions in the handling, storage and use of quicklime.

PART 2 PRODUCTS

2.1 WATER

A. Water shall be clean; clear; and free from oil, acids, alkali, or vegetable matter.

2.2 LIME

A. Type A - Hydrated lime: Dry material consisting essentially of calcium hydroxide or mixture of calcium hydroxide and an allowable percentage of calcium oxide and magnesium hydroxide.

B. Type B - Commercial lime slurry: Liquid mixture consisting essentially of lime solids and water in slurry form. Water or liquid portion shall not contain dissolved material in sufficient quantity to be injurious or objectionable for purpose intended.

C. Type C - Quicklime: Dry material consisting essentially of calcium oxide. Furnish quicklime in either of the followinggrades:

1. Grade DS: Pebble quicklime of a gradation suitable for use in the preparation of a slurry for wet placing.
2. Grade S: Finely-graded quicklime for use in the preparation of slurry for wet placing. Do not use grade S quicklime for dry placing.

D. Lime shall conform to requirements of Item 260 of the 1993 Texas Department of Transportation Standard Specifications.

E. Lime slurry may be delivered to the job site as commercial lime, or may be prepared at the job site by using hydrated lime or quicklime. The slurry shall be free of liquids other than water and shall be of a consistency that can be handled and uniformly applied without difficulty.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted sub grade is ready to support imposed loads.

B. Verify sub grade lines and grades are correct.

3.2 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Cut material to bottom of sub grade using an approved cutting and pulverizing machine meeting followingrequirements:

1. Cutters accurately provide a smooth surface over entire width of cut to plane of secondary grade.
2. Visible indication that cut is to proper depth.

C. Alternatively, scarify or excavate to bottom of stabilized sub grade. Remove material or windrow to expose secondary grade. Correct wet or unstable material below secondary grade by scarifying, adding lime, and compacting. Obtain uniformstability.

3.3 LIME SLURRY APPLICATION

A. Mix hydrated lime or quicklime with water to form a slurry of the solids content specified. Commercial lime slurry shall have dry solids content as specified. Conform to cautionary requirements of Paragraph 1.06C concerning use of quicklime.

B. Apply slurry with a distributer truck equipped with an agitator to keep lime and water in a consistent mixture. Make successive passes over measured section of roadway to attain proper moisture and lime content. Limit spreading to an area where preliminary mixing operations can be completed on the same working day.

C. Apply so that dry sub grade will contain a minimum lime content of 7 percent by weight of dry sub grade unless otherwise instructed by Testing Laboratory.

3.4 PRELIMINARY MIXING

A. Do not mix and place material when temperature is below 40 degrees F and falling. Base may be placed when temperature taken in shade and away from artificial heat is above 35 degrees F and rising.

B. Use approved single-pass or multiple-pass rotary speed mixers to mix soil, lime, and water to required depth. Obtain a homogeneous friable mixture free of clods andlumps.

C. Shape mixed sub grade to final lines and grades.

D. Eliminate following operations and final mixing if pulverization requirements of Paragraph 3.05C can be met during preliminary mixing:

1. Seal sub grade as a precaution against heavy rainfall by rolling lightly with light pneumatic rollers.
2. Cure soil-lime material for 1 to 4 days. Keep sub grade moist duringcure.

3.5 FINAL MIXING

A. Use approved single-pass or multiple-pass rotary speed mixers to uniformly mix cured soil and lime to requireddepth.

B. Add water to bring moisture content of soil mixture to a minimum of optimum or above.

C. Mix and pulverize until all material passes a 1-3/4-inch sieve; a minimum of 85 percent, excluding nonslacking fractions, passes a 3/4-inch sieve; and a minimum of 60 percent excluding nonslacking fractions passes a No. 4 sieve.

D. Shape mixed sub grade to final lines and grades.

E. Do not expose hydrated lime to open air for 6 hours or more during interval between

application and mixing. Avoid excessive hydrated lime loss due to washing or blowing.

3.6 COMPACTION

A. Aerate or sprinkle to attain optimum moisture content as determined by Testing Laboratory. Remove and reconstruct sections where average moisture content exceeds ranges specified at time of final compaction.

B. Start compaction immediately after final mixing, unless approved by Engineer.

C. Spread and compact in two or more approximately equal layers where total compacted thickness is to be greater than 8 inches.

D. Compact with approved heavy pneumatic or vibrating rollers, or a combination of tamping rollers and light pneumatic rollers. Begin compaction at the bottom and continue until entire depth is uniformly compacted.

E. Do not allow stabilized base to mix with underlying material. Correct irregularities or weak spots immediately by replacing material and recompacting.

F. Compact to following minimum densities at a moisture content of optimum to 3 percent above optimum as determined by ASTM D698, unless otherwise indicated on the Drawings:

1. Areas to receive pavement without subsequent base course: Minimum density of 98 percent of maximum dry density.
2. Areas to receive subsequent base course: Minimum density of 95 percent of maximum dry density.

G. Seal with approved light pneumatic tired rollers: Prevent surface hair line cracking. Rework and recompact at areas where hair line cracking develops.

3.7 CURING

A. Moist cure for a minimum of 3 days before placing base or surface course, or opening to traffic. Time may be adjusted as approved by Engineer. Sub grade may be opened to traffic after 2 days if adequate strength has been attained to prevent damage. Restrict traffic to light pneumatic rollers or vehicles weighing less than 10 tons.

B. Keep sub grade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.

C. Place base, surface, or seal course within 14 days after final mixing and compaction unless prior approval is obtained from the Engineer.

3.8 TOLERANCES

A. Completed surface shall be smooth and conform to typical section and established lines and grades.

B. Top of compacted surface: Plus or minus 1/4 inch in cross section or in 16 foot length.

3.9 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Section - Testing Laboratory Services.

B. A minimum of one phenolphthalein test will be made at random locations per 1000 linear feet per lane of roadway or 500 square yards of base to determine in-place depth.

C. Contractor may, at his own expense, request additional cores in the vicinity of cores indicating nonconforming in-place depths. If the average of the tests falls below the required depth, place and compact additional material at no cost to the Owner.

D. Compaction Testing will be performed in accordance with ASTM D1556 or ASTM D2922 and ASTM D3017 at random locations near depth determination tests. Rework and recompact areas that do not conform to compaction requirements at no cost to the Owner.

E. Fill test sections with new compacted lime stabilized sub grade.

3.10 PROTECTION

A. Maintain stabilized sub grade to lines and grades and in good condition until placement of base or surface course. Protect the asphalt membrane, if used, from being picked up by traffic.

B. Repair defects immediately by replacing material to full depth.

END OF SECTION 32 11 13.13

SECTION 32 11 16

DRAINAGE STONE BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Drainage stone base material under synthetic grass surfacing.
   2. HDPE Liner.

B. Related Sections:
   1. Section 11 68 00 - Play Field Equipment and Structures.
   2. Section 32 18 13.10 - Synthetic Grass Surfacing

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 33 23 - Shop Drawings, Product Data and Samples.

B. Product Data: For each type of product:
   1. Include construction details, material descriptions, and accessories for geomembrane liners.

C. Submit test reports from commercial laboratory as outlined herein.

D. Submit reproducible drawing as described under “Record Drawings” Paragraph prior to placement of synthetic turf.

1.3 WARRANTY

A. Manufacture agrees to repair or replace geomembrane line that fails in materials or workmanship within specified warranty period:
   1. Failures include, but are not limited to, the following:
      a. Leaks in geomembrane liner.
      b. Defects in seams.
   2. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DRAINAGE STONE BASE

A. Drainage stone base shall consist of a 4" coarse utility drainage stone base topped with a 2" layer of crushed limestone finish course. Stone base material used shall be obtained from crushing limestone. Crushed stone used on this project shall conform to the requirements of ASTM C33 - #57, ASTM C33 - #8, and AASHTO. Stone shall conform to the following sieve analysis.

	% Passing	
Sieves	Base Stone	Finish Course
3"	---	---
2"	---	---
1 1/2”	100	---
1"	95-100	---
3/4”	---	---
1/2”	25-60	100
3/8”	---	85-100
1/4”	25-65	---
#4	0-10	10-30
#8	0-5	0-10
#16	---	0-5

B. Drainage stone base system shall have a minimum percolation rate of 30" per hour. Contractor shall provide test results that confirm the base system meets this requirement.

C. Material source must be approved by the Architect.

2.2 HDPE LINER

A. Provide “Titan 20”, a 20-mil liner of woven strips of HDPE (High-Density Polyethylene) encased in low density polyethylene coating as manufactured by Titan Environmental USA and Intertape Polymer Group (IPG) or equivalent.
   1. System has the following performance properties:

TESTED PROPERTY	TEST METHOD	UNIT
Tensile	D7003	133 lb./in.
Tear Resistance	D5844	60 lbs.
Puncture Resistance	D4833	113 lbs.
Weight	lb./sq.ft.	.05 lb./sq.ft.
Hydrostatic Resistance	D6241	922 lb.
Low Temperature Flex	D2136	Md & TD: Pass @ -40 C
CBR Static Puncture	D6241	922 lbs.
Tongue Tear-Large Scale	D5884	MD & TD: 60 lbs.
MVTR	E96	0.40 g/m² 24 hr
Mullen Burst	D751	375 psi
Hydraulic Conductivity	(from MVTR)	1.97×10^{-12} cm/s
Carbon Black Content	D4218	3%

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. The subgrade shall be excavated and shaped in conformity with the typical sections shown on drawings. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material. All holes, ruts and depressions shall be filled with approved material and, if required, the subgrade shall be thoroughly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the base material. Subgrade shall be proof rolled to detect any soft spots. The surface of the subgrade shall be shaped with laser guided equipment and shall be finished to line and grade as established and in conformity with the typical section shown on drawings, and any deviation in excess of 0.1 foot in cross section and in a length of 16 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling. Sufficient subgrade shall be prepared in advance to insure satisfaction prosecution of the work.

3.2 PLACEMENT OF GEOTEXTILE

A. Prior to placing the drainage stone base, liner shall be spread over the entire subgrade so that none of the stone base comes in contact with the existing soil. Install liner in strict accordance with manufacturer’s written instructions and recommendations, including overlapping and ‘welding’ seams.

3.3 PLACING

A. The base stone and finish course material shall be delivered in approved vehicles of a uniform capacity, and it shall be the charge of the Owner that the required amount of specified material shall be delivered to secure the proper thickness of each course. Material shall be dumped around the perimeter of the field and spread with tracked equipment. Spreading equipment shall always be fully supported by the stone base material. Contractor shall avoid overstressing the soils by utilizing equipment that spreads the base material and only exerts moderate pressure on the subgrade. Rutting at the time of placement is an indication of overstressing the subgrade. In the event inclement weather or other unforseen circumstances render impractical the spreading of the material during the first 24-hour period, the material shall be scarified and spread as directed by the Owner’s Representative. The material shall be sprinkled, if directed, and shall then be bladed, dragged and shaped with laser guided equipment to conform to typical sections as shown on drawings. All areas and “nests” of segregated coarse or fine material shall be corrected or removed and replaced with well graded material.

3.4 COMPACTION

A. The stone base shall be sprinkled and compacted with four passes of a steel-wheeled, minimum 20-ton vibratory roller. Any areas of material that do not compact properly will be corrected immediately by scarifying the area affected, reshaping and recompacting.

3.5 FINISH GRADING

A. The drainage stone base shall be fine graded using laser guided equipment. The finish grade shall be within 0.01 foot of proper subgrade elevation.

3.6 RECORD DRAWINGS

A. Upon completion of the stone base grading and compaction the Contractor shall paint a twenty foot (20') grid over the entire field. Grade shots will be taken by a registered public surveyor at each grid line intersection. The grades will be transferred to a reproducible drawing of the football field. The Synthetic Turf Installation Contractor and the Architect must approve the Record Drawings prior to placement of the synthetic turf. The Synthetic Turf Installation Contractor and the Architect must visually observe the painted grid lines to determine if there are any high spots, low spots, undulations, etc., in the stone base. Any irregularities that will affect the accuracy of the yard lines on the field shall be corrected prior to placement of the synthetic turf.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 32 13 13

CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Portland cement concrete paving.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

B. ASTM A 185 - Standard Specifications for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

C. ASTM A 615 - Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.

D. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

E. ASTM C 33 - Standard Specifications for Concrete Aggregates.

F. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

G. ASTM C 40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

H. ASTM C 42 - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

I. ASTM C 78 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third Point Loading).

J. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

K. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

L. ASTM C 136 - Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

M. ASTM C 138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

N. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

O. ASTM C 150 - Standard Specification for Portland Cement.

P. ASTM C 174 - Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores.

Q. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

R. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

S. ASTMC494 -Standard Specification for Chemical Admixtures for Concrete.

T. ASTMC618 -Standard Specification for Coal Fly Ash and Raw or Calcined Natural

Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.

U. TxDOT Tex-203-F - Sand Equivalent Test.

V. TxDOT Tex-406-A - Material Finer than 75 Fm (No. 200) Sieve In Mineral Aggregates (Decantation Test for Cement Aggregates).

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit proposed mix design and test data for each type and strength of concrete in Work. Include proportions and actual flexural strength obtained from design mixes at required test ages.

C. Submit for approval manufacturer's description and characteristics for mixing equipment, and for traveling form paver, when proposed for use.

D. Submit manufacturer's certificates giving properties of reinforcing steel. Include certificate of compliance with ASTM A 82. Provide specimens for testing when required by Owner's Representative.

1.5 HANDLING AND STORAGE

A. Do not mix different classes of aggregate without written permission of Owner's Representative.

B. Class of aggregate being used may be changed before or during Work with written permission of Owner's Representative. Comply new class with specifications.

C. Reject segregated aggregate. Before using aggregate whose particles are separated by size, mix them uniformly to grading requirements.

D. Reject aggregates mixed with dirt, weeds, or foreign matter.

E. Do not dump or store aggregate in roadbed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Portland Cement:
1. Sample and test cement to verify compliance with Standards of ASTM C 150, Type I or Type III.
2. Bulk cement which meets referenced standards may be used when method of handling is approved by Owner's Representative. When using bulk cement, provide satisfactory weighing devices.
3. Fly ash which meets standards of ASTM C 618 may be used as mineral fill when method of handling is approved by Owner's Representative.

B. Water: Conform to requirements for water in ASTM C 94.

C. Coarse Aggregate: Crushed stone, gravel, or combination thereof, which is clean, hard, and durable, conforms to requirements of ASTM C 33, and has abrasion loss not more than 45 percent by weight when subjected to Los Angeles Abrasion Test (ASTM C 131).

1. Maximum percentage by weight of deleterious substances shall not exceed following values:

	Percent by Weight of Total Sample

Item	Maximum
Clay lumps and friable particles	3.0
Material finer than 75-um (No. 200) sieve: Concrete subject to abrasion	3.0*
All other concrete	5.0*

Coal and lignite:

Where surface appearance of concrete is of importance	0.5
All other concrete	1.0

* In case of manufactured sand, when material finer than 75-pm (No. 200) sieve consists of dust of fracture, essentially free from clay or shale, these limits may be increased to 5 and 7 percent, respectively.

2. Conform coarse aggregate (size 1 1/2 inch to No. 4 sieve) to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 1%" sieve	0
Retained on 1%" sieve	0 to 5
Retained on %" sieve	30 to 65
Retained on 3/8" sieve	70 to 90
Retained on No. 4 sieve	95 to 100
Loss by Decantation Test *Method Tex-406-A	1.0 maximum

* In case of aggregates made primarily from crushing of stone, when material finer than 200 sieve is dust of fracture essentially free from clay or shale as established by Part III of TxDOT Tex-406-A, percent may be increased to 1.5.

D. Fine Aggregate: Sand, manufactured sand, or combination thereof, composed of clean, hard, durable, uncoated grains, free from loams or other injurious foreign matter. Conform fine aggregate for concrete to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

E.

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 3/8" sieve	0
Retained on No. 4 sieve	0 to 5
Retained on No. 8 sieve	0 to 20
Retained on No. 16 sieve	15 to 50
Retained on No. 30 sieve	35 to 75
Retained on No. 50 sieve	65 to 90
Retained on No. 100 sieve	90 to 100
Retained on No. 200 sieve	97 to 100

1. When subjected to color test for organic impurities (ASTM C 40), fine aggregate shall not show color darker than standard color. Fine aggregate shall be subjected to Sand Equivalent Test (Tex-203-F). Sand equivalent value shall not be less than 80, unless higher value is shown on Drawings.

F. Mineral Filler: Type "C" or Type "F" fly ash of acceptable quality and meeting requirements of ASTM C 618 may be used as mineral admixture in concrete mixture as approved by the Engineer. When fly ash mineral filler is used, store and inspect in accordance with ASTM C 618. Do not use fly ash in amounts to exceed 25 percent by weight of cementatious material in mix design. Cement

content may be reduced when strength requirements can be met. Note: When fly ash is used, term "cement" is defined as cement plus fly ash.

G. Air Entraining Agent: Furnish air entraining agent conforming to requirements of ASTM C 260.

H. Water Reducer: Water reducing admixture conforming to requirements of ASTM C 494 may be used when required to improve workability of concrete. Amount and type of admixture is subject to approval by Owner's Representative.

I. Reinforcing Steel:

1. Provide new billet steel manufactured by open hearth process and conforming to ASTM A 615, Grade 60. Store steel to protect it from mechanical injury and rust. At time of placement, steel shall be free from dirt, scale, rust, paint, oil, or other injurious materials.
2. Cold bend reinforcing steel to shapes shown. Once steel has been bent, it may not be rebent.
3. Provide wire fabric conforming to ASTM A 82. Use fabric in which longitudinal and transverse wires have been electrically welded at points of intersection. Welds shall have sufficient strength not to be broken during handling or placing. Conform welding and fabrication of fabric sheets to ASTM A 185.

2.2 EQUIPMENT

2.3 Conform Equipment to requirements of ASTM C 94.MIXING

A. Flexural strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C78 (using simple beam with third-point loading). Compressive strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C 39. Determine and measure batch quantity of each ingredient, including water for batch designs and all concrete produced for Work. Mix shall conform to these specifications and other requirements indicated on Drawings.

B. Mix design to produce concrete which will have minimum compressive strength of 3,000 psi at 7 days and 3,500 psi at 28 days. Slump of concrete shall be at least 2 inches but no more than 5 inches, when tested in accordance with ASTM C 143.

1. Concrete pavement, including curb, curb and gutter, and saw-tooth curb, shall contain at least 5 1/2 sacks (94 pounds per sack) of cement per cubic yard, with not more than 6.5 gallons of water, net, per sack of cement (water-cement ratio maximum 0. 57). Determine cement content in accordance with ASTM C 138. Addition of mineral filler may be used to improve workability or plasticity of concrete to limits specified.
2. Coarse dry aggregate shall not exceed 85 percent of loose volume of concrete.
3. Add air-entraining admixture to ensure uniform distribution of agent throughout batch. Base air content of freshly mixed air-entrained concrete upon trial mixes with materials to be used in Work, adjusted to produce concrete of required plasticity and workability. Percentage of air entrainment in mix shall be 4 1/2 percent plus or minus 1 1/2 percent. Determine air content by testing in accordance with ASTM C 231.
4. Use retardant when temperature exceeds 90 degrees F. Proportion as recommended by manufacturer. Use same brand as used for air-entraining agent. Add and batch material using same methods as used for air-entraining agent.

C. Use high early strength concrete pavement to limits shown on Drawings. Design to meet following:

1. Concrete Mix: Flexural strength greater than or equal to 500 psi at 72 hours.
2. Cement: Minimum of 7 sacks of cement per cubic yard of concrete.

3. Water-Cement Ratio maximum of 0.45. Slump of concrete shall a maximum of 5 inches, when tested in accordance with ASTM C 143.
4. Other requirements for proportioning, mixing, execution, testing, etc., shall be in accordance with this Division 32.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted base is ready to support imposed loads and meets compaction requirements.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Properly prepare, shape and compact each section of subgrade before placing forms, reinforcing steel or concrete. After forms have been set to proper grade and alignment, use subgrade planer to shape subgrade to its final cross section. Check contour of subgrade with template.

B. Remove subgrade that will not support loaded form. Replace and compact subgrade to required density.

3.3 EQUIPMENT

A. Alternate equipment and methods, other than those required by this Section, may be used provided equal or better results will be obtained. Maintain equipment for preparing subgrade and for finishing and compacting concrete in good working order.

B. Subgrade Planer and Template:

1. Use subgrade planer with adjustable cutting blades to trim subgrade to exact section shown on Drawings. Select planer mounted on visible rollers which ride on forms. Planer frame must have sufficient weight so that it will remain on form, and have strength and rigidity that, under tests made by changing support from wheels to center, planer will not develop deflection of more than 1/8 inch. Tractors used to pull planer shall not produce ruts or indentations in subgrade. When slip form method of paving is used, operate subgrade planer on prepared track grade or have it controlled by electronic sensor system operated from string line to establish horizontal alignment and elevation of subbase.
2. Provide template for checking contour of subgrade. Template shall be long enough to rest upon side forms and have strength and rigidity that, when supported at center, maximum deflection shall not exceed 1/8 inch. Fit template with accurately adjustable rods projecting downward at 1 foot intervals. Adjust these rods to gauge cross sections of slab bottom when template is resting on side forms.

C. Concrete Finishing

Surface	Finish	Thickness	Strength
Sidewalks	Broom, Medium	4 1/2”	3,000 psi
Parking	Broom, Heavy	5”	3,500 psi
Drives	Broom, Heavy	6”	3,500 psi

D. Vibrators: Furnish mechanically-operated, synchronized vibrators mounted on tamping bar which rides on forms and hand-manipulated mechanical vibrators. Furnish vibrators with frequency of vibration to provide maximum consolidation of concrete without segregation.

E. Traveling Form Paver: Approved traveling form paver may be used in lieu of construction methods employing forms, consolidating, finishing and floating equipment. Meet requirements of this specification for subgrade, pavement tolerances, pavement depth, alignments, consolidation, finishing and workmanship. When traveling form paver does not provide concrete paving that meets compaction,

finish, and tolerance requirements of this Specification, immediately discontinue its use and use conventional methods.

1. Equip traveling paver with longitudinal transangular finishing float adjustable to crown and grade. Use float long enough to extend across pavement to side forms or edge of slab.
2. Ensure that continuous deposit of concrete can be made at paver to minimize starting and stopping. Use conventional means of paving locations inaccessible to traveling paver, or having horizontal or vertical curvature that traveling paver cannot negotiate.
3. Where Drawings require tie bars for adjacent paving, securely tie and support bars to prevent displacement. Tie bars may be installed with approved mechanical bar inserter mounted on traveling-form paver. Replace pavement in which tie bars assume final position other than that shown on Drawings.

3.4 FORMS

A. Side Forms: Use forms of approved shape and section. Form depth shall be equal to required edge thickness of pavement. Forms with depths greater or than required edge thickness of pavement will be permitted, provided difference between form depth and edge thickness when not greater than 1 inch. Length of form sections shall be not less than 10 feet and each section shall provide for staking in position with not less than 3 pins. Flexible or curved forms of wood or metal of proper radius shall be used for curves of 200 foot radius or less. Forms shall have ample strength and shall be provided with adequate devices for secure setting so that when in-place they will withstand, without visible springing or settlement, impact and vibration of finishing machine. Forms shall be free from warp, bends or kinks and shall be sufficiently true to provide straight edge on concrete. Top of each form section, when tested with straight edge, shall conform to requirements specified for surface of completed pavement. Provide sufficient forms for satisfactory placement of concrete. For short radius curves, forms less than 10 feet in length or curved forms may be used.

B. Form Setting:

1. Rest forms directly on subgrade. Do not shim with pebbles or dirt. Accurately set forms to required grade and alignment and, during entire operation of placing, compacting and finishing of concrete, do not deviate from this grade and alignment more than 1/8 inch in 10 feet of length. Do not remove forms for at least 8 hours after completion of finishing operations. Provide supply of forms that will be adequate for orderly and continuous placing of concrete. Set forms and check grade for at least 300 feet ahead of mixer or as approved by Owner's Representative.
2. Adjacent slabs may be used instead of forms, provided that concrete is well protected from possible damage by finishing equipment. Do not use adjacent slabs for forms until concrete has aged at least 7 days.

3.5 REINFORCING STEEL AND JOINT ASSEMBLIES

A. Place reinforcing steel and joint assemblies and position securely as indicated on Drawings. Wire reinforcing bars securely together at intersections and splices. Bars and coatings shall be free of rust, dirt or other foreign matter when concrete is placed. Secure reinforcing steel to chairs.

B. Position pavement joint assemblies at required locations and elevations, and rigidly secure in position. Install dowel bars in joint assemblies, each parallel to pavement surface and to center line of pavement, as shown.

C. Cut header boards, joint filler, and other material used for forming joints to receive each dowel bar.

D. Secure in required position to prevent displacement during placing and finishing of concrete.

E. Drill dowels into existing pavement, secure with epoxy, and provide paving headers as required to provide rigid pavement sections.

F. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable

tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than 1/12 of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

3.6 FIBROUS REINFORCING

A. Do not use fibrous reinforcing to replace structural, load-bearing, or moment-reinforcing steel.

3.7 PLACEMENT

A. Place concrete when air temperature taken in shade and away from artificial heat is above 35 degrees F and rising. Do not place concrete when temperature is below 40 degrees F and falling.

B. Place concrete within 90 minutes after initial water had been added. Remove and dispose of concrete not placed within this period.

C. Concrete slump during placement shall be 1 to 5 inches, except when using traveling-form paver, slump shall be maximum of 2 inches.

D. Deposit concrete continuously in successive batches. Distribute concrete in manner that will require as little rehandling as possible. Where hand spreading is necessary, distribute concrete with shovels or by other approved methods. Use only concrete rakes in handling concrete. At placement interruption of more than 30 minutes, place transverse construction joint at stopping point. Remove and replace sections less than 10 feet long.

E. Take special care in placing and spading concrete against forms and at longitudinal and transverse joints to prevent honeycombing. Voids in edge of finished pavement will be cause for rejection.

3.8 COMPACTION

A. Consolidate concrete using mechanical vibrators as specified herein. Extend vibratory unit across pavement, not quite touching side forms. Space individual vibrators at close enough intervals to vibrate and consolidate entire width of pavement uniformly. Mount mechanical vibrators to avoid contact with forms, reinforcement, transverse or longitudinal joints.

B. Furnish enough hand-manipulated mechanical vibrators for proper consolidation of concrete along forms, at joints and in areas not covered by mechanically controlled vibrators.

3.9 FINISHING

A. Finish concrete pavement with power-driven transverse finishing machines or by hand finishing methods.

1. Hand finish with mechanical strike and tamping template in same width as pavement to be finished. Shape template to pavement section shown on Drawings. Move strike template forward in direction of placement, maintaining slight excess of material in front of cutting edge. Make minimum of two trips over each area. Screed pavement surface to required section. Work screed with combined transverse and longitudinal motion in direction work is progressing. Maintain screed in contact with forms. Use longitudinal float to level surface.

B. On narrow strips and transitions, finish concrete pavement by hand. Thoroughly work concrete around reinforcement and embedded fixtures. Strike off concrete with strike-off screed. Move strike-off screed forward with combined transverse and longitudinal motion in direction work is progressing, maintaining screed in contact with forms, and maintaining slight excess of materials in front of cutting edge. Tamp concrete with tamping template.
Use longitudinal float to level surface.

C. After completion of straightedge operation, make first pass of burlap drag or transverse broom as soon as construction operations permit and before water sheen has disappeared from

surface. Follow with as many passes as required to produce desired texture depth. Permit no unnecessary delays between passes. Keep drag wet, clean and free from encrusted mortar during use.

3.10 JOINTS AND JOINT SEALING

A. Conform to requirements of Division 32.

3.11 CONCRETE CURING

A. Conform to requirements of Division 32.

3.12 TOLERANCES

A. Test entire surface before initial set and correct irregularities or undulations. Bring surface within requirements of following test and then finish. Place 10 foot straightedge parallel to center of roadway to bridge depressions and touch high spots. Do not permit ordinates measured from face of straight edge to surface of pavement to exceed 1/16 inch per foot from nearest point of contact. Maximum ordinate with 10 foot straightedge shall not exceed 1/8 inch. Grind spots in excess of required tolerances to meet surface test requirements. Restore texture by grooving concrete to meet surface finishing specifications.

3.13 FIELD QUALITY CONTROL

A. Perform testing under provisions of Division 1.

B. Compressive Strength Test Specimens: Make four test specimens for compressive strength test in accordance with ASTM C 31 for each 150 cubic yards or less of pavement that is placed in one day. Test two specimens at 7 days or at number of hours as directed by the Owner's Representative for high early strength concrete. Test remaining two specimens at 28 days. Test specimens in accordance with ASTM C 39. Minimum compressive strength shall be 3000 pounds per square inch for first two specimens and 3500 pounds per square inch at 28 days.

C. When compressive test indicates failure, make yield test in accordance with ASTM C 138 for cement content per cubic yard of concrete. When cement content is found to be less than that specified per cubic yard, increase batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. Minimum of one 4 inch core will be taken at random locations per 375 feet per 12 feet lane or 500 square yards of pavement to measure in-place depth. Measure depth in accordance with ASTM C 174. Each core may be tested for 28 day compressive strength according to methods of ASTM C 42. 28 day compressive strength of each core tested shall be a minimum of 3000 pounds per square inch.

E. Request, at option, three additional cores in vicinity of cores indicating nonconforming inplace depths at no cost to Owner. In-place depth at these locations shall be average depth of four cores.

F. Fill cores and density test sections with new concrete paving or non shrink grout.

3.14 NONCONFORMING PAVEMENT

A. Remove and replace areas of pavement found deficient in thickness, or that fail compressive strength tests, with concrete of thickness shown on Drawings.

B. When measurement of any core is less than specified thickness, actual thickness of pavement in this area will be determined by taking additional cores at 10 foot intervals parallel to centerline in each direction from deficient core until, in each direction, core is taken which is not deficient by more than 10 percent. Exploratory cores for deficient thickness will not be used in averages for adjusted unit price. Exploratory cores are to be used only to determine length of pavement in unit that is to be removed and replaced. Replace nonconforming pavement sections at no additional cost to Owner.

3.15 PAVEMENT MARKINGS

A. Restore pavement markings to match those existing in accordance with the applicable governmental standard specifications and details and Owner's Representative's requirements.

3.16 PROTECTION

A. Barricade pavement section to prevent use until concrete has attained minimum design strength. Cure barricade pavement section for minimum 72 hours before use. Do not open pavement to traffic until concrete is at least 10 days old. Pavement may be open to traffic earlier provided Contractor pays for testing and additional specimen once 7 day specified strength is obtained. Pavement may be opened when high early strength concrete is used meeting specified 72 hour strength.

B. High early strength concrete may be used to provide access at driveways, street intersections, esplanades and other locations approved by Owner's Representative.

C. On those sections of pavement to be opened to traffic, seal joints, clean pavement, and place earth against pavement edges before permitting use by traffic. Opening of pavement to traffic shall not relieve responsibility for Work.

D. Maintain concrete paving in good condition until completion of Work.

E. Repair defects by replacing concrete to full depth.

END OF SECTION 32 13 13

SECTION 32 13 13.10

CONCRETE PAVING CURING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Curing of Portland cement concrete paving.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM C 156 - Standard Test Method for Water Retention by Concrete Curing Materials.

B. ASTM C 171 - Standard Specifications for Sheet Materials for Curing Concrete.

C. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit manufacturer's product data for cover materials and liquid membrane-forming compounds.

PART 2 PRODUCTS

2.1 COVER MATERIALS FOR CURING

A. Conform curing materials to one of the following:

1. Polyethylene Film: Opaque pigmented white film conforming to requirements of ASTM C 171.
2. Waterproofed Paper: Paper conforming to requirements of ASTM C 171.
3. Cotton Mats: Single layer of cotton filler completely enclosed in cover of cotton cloth. Mats shall contain not less than 3/4 of a pound of uniformly distributed cotton filler per square yard of mat. Cotton cloth used for covering materials shall weigh not less than 6 ounces per square yard. Stitch mats so that mat will contact surface of pavement at all points when saturated with water.

2.2 LIQUID MEMBRANE-FORMING COMPOUNDS

A. Conform liquid membrane-forming compounds to ASTM C 309. Membrane shall restrict loss of water to not more than 0.55 kg/m2 in 72 hours using test method ASTM C 156.

PART 3 EXECUTION

3.1 CURING REQUIREMENT

A. Cure concrete pavement by protecting against loss of moisture for period of not less than 72 hours immediately upon completion of finishing operations. Do not use membrane curing for concrete pavement to be overlaid by asphalt concrete.

B. Failure to provide sufficient cover material shall be cause for immediate suspension of concreting

operations.

3.2 POLYETHYLENE FILM CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, apply water in form of fine spray. Cover surface with polyethylene film so film will remain in direct contact with surface during specified curing period.

B. Cover entire surface and both edges of pavement slab. Overlap joints in film sheets minimum of 12 inches. Immediately repair tears or holes occurring during curing period by placing acceptable moisture-proof patches or replacing.

3.3 WATERPROOFED PAPER CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, apply water in form of fine spray. Cover surface with waterproofed paper so paper will remain in direct contact with surface during specified curing period.

B. Prepare waterproofed paper to form blankets of sufficient width to cover entire surface and both edges of pavement slab, and not be more than 60 feet in length. Overlap joints in blankets caused by joining paper sheets not less than 5 inches and securely seal with asphalt cement having melting point of approximately 180 degrees F. Place blankets to secure overlap of at least 12 inches. Immediately repair tears or holes appearing in paper during curing period by cementing patches over defects.

3.4 COTTON MAT CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, completely cover surface with cotton mats, thoroughly saturated before application, maintaining contact with surface of pavement equally at all points.

B. Keep mats on pavement for specified curing period. Keep mats saturated so that, when lightly compressed, water will drip freely from them. Keep banked earth or cotton mat covering edges saturated.

3.5 LIQUID MEMBRANE-FORMING COMPOUNDS

A. Immediately after free surface moisture, and after concrete has dispersed, apply liquid membrane-forming compound in accordance with manufacturer's instructions.

B. Moisten concrete by water fogging prior to application of membrane when surface has become dry.

C. Seal concrete surface with single coat at rate of coverage recommended by manufacturer and directed by Owner's Representative, but not less than one gallon per 200 square feet of surface area.

3.6 TESTING MEMBRANE

A. Treated areas will be visually inspected for areas of lighter color of dry concrete as compared to dump concrete. Test suspected areas by placing few drops of water on surface. Membrane passes test when water stands in rounded beads or small pools which can be blown along surface of concrete without wetting surface.

B. Re-Apply membrane compound immediately at no cost to Owner when membrane fails above test.

END OF SECTION 32 13 13.10

SECTION 32 13 13.25

CONCRETE SIDEWALKS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforced concrete sidewalks.

B. Wheelchair ramps.

C. Reinforced slope paving.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in Field.

B. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

C. ASTM C 42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

D. ASTM C 138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

E. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

F. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

G. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).

H. Texas Accessibility Standards of Architectural Barriers Act, Article 9102, Texas Civil Statues.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit certified testing results and certificates of compliance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Division 32.

B. Reinforcing Steel: Conform to material requirements of Division 32. Use No. 3 reinforcing bars.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Division 32.

D. Expansion Joint Filler: Conform to material requirements for expansion joint material of Division 31

E. Forms: Use straight, unwarped wood or metal forms with nominal depth equal to or greater

than proposed sidewalk thickness. The use of 2 inch by 4 inch lumber as forms will not be allowed.

F. Sand Bed: Conform to material requirements for bank run sand of Division 31.

G. Sodding: Conform to material requirements for sodding of Division 31.

H. Coloring for wheelchair ramps: Conform to material requirements for colored concrete of Division 31. Color shall be Brick Red or as shown on the drawings.

PART 3 EXECUTION

3.1 REPLACEMENT

A. Replace sidewalks and slope paving which are removed or damaged during construction with thickness and width equivalent to one removed or damaged, unless otherwise shown on Drawings. Finish surface (exposed aggregate, brick pavers, etc.) to match existing sidewalk.

B. Provide replaced and new sidewalks with wheelchair ramps when sidewalk intersects curb at street or driveway.

3.2 PREPARATION

A. Identify and protect utilities which are to remain.

B. Protect living trees, other plant growth, and features designated to remain.

C. Conduct clearing and grubbing operations in accordance with Division 31.

D. Excavate subgrade 6 inches beyond outside lines of sidewalk. Shape to line, grade and cross section. For soils with plasticity index above 40 percent, stabilize soil with lime in accordance with Division 31. Compact subgrade to minimum of 90 percent maximum dry density at optimum to 3 percent above optimum moisture content, as determined by ASTM D 698.

E. Immediately after subgrade is prepared, begin form work and concrete placement.

3.3 PLACEMENT

A. Setting Forms: Straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. Use of 2 by 4's as forms will not be allowed. Securely stake forms to line and grade. Maintain position during concrete placement.

B. Reinforcement:

1. Install reinforcing bars.
2. Install reinforcing steel as shown on the drawings. Lay longitudinal bars in walk continuously, except through expansion joints.
3. Use sufficient number of chairs to support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.
4. Drill dowels into existing paving, sidewalk and driveways, secure with epoxy, and provide headers as required.
5. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than 1/12 of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

C. Expansion Joints: Install expansion joints with load transfer units in accordance with Division

32.

D. Place concrete in forms to specified depth and tamp thoroughly with "jitterbug" tamp, or other acceptable method. Bring mortar to surface.

E. Strike off to smooth finish with wood strike board. Finish smoothly with wood hand float. Brush across sidewalk lightly with fine-haired brush.

F. Apply coating to wheelchair ramp with contrasting color in accordance with Division 32.

G. Unless otherwise indicated on Drawings, mark off sidewalk joints 1/8 inch deep, at spacing equal to width of walk. Use joint tool equal in width to edging tool.

H. Finish edges with tool having 1/4 inch radius.

I. After concrete has set sufficiently, refill space along sides of sidewalk to one-inch from top of walk with suitable material. Tamp until firm and solid, place sod as applicable. Dispose of excess material in accordance with Division 1. Repair driveways and parking lots damaged by sidewalk excavation in accordance with Division 32.

3.4 CURING

A. Conform to requirements of Division 32.

3.5 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Division 1.

B. Compressive Strength Test Specimens: Four test specimens for compressive strength test will be made in accordance with ASTM C 31 for each 30 cubic yards or less of sidewalk that is placed in one day. Two specimens will be tested at 7 days. Remaining two specimens will be tested at 28 days. Specimens will be tested in accordance with ASTM C 39. Minimum compressive strength: 2500 psi at 7 days and 3000 psi at 28 days.

C. Yield test for cement content per cubic yard of concrete will be made in accordance with ASTM C 138. When cement content is found to be less than that specified per cubic yard, reduce batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. If the Contractor places concrete without notifying the laboratory, the Owner will have the concrete tested by means of core test as specified in ASTM C 42. When concrete does not meet specification, cost of test will be deducted from payment.

E. Sampling of fresh concrete shall be in accordance with ASTM C 172.

F. Take slump tests when cylinders are made and when concrete slump appears excessive.

G. Concrete shall be acceptable when average of two 28 day compression tests is equal to or greater than minimum 28 day strength specified.

H. If either of two tests on field samples is less than average of two tests by more than 10 percent, that entire test shall be considered erratic and not indicative of concrete strength. Core samples will be required of in-place concrete in question.

I. If 28 day laboratory test indicates that concrete of low strength has been placed, test concrete in question by taking cores as directed by Owner's Representative. Take and test at least three representative cores as specified in ASTM C 42 and deduct cost from payment due.

3.6 NONCONFORMING CONCRETE

A. Remove and replace areas that fail compressive strength tests, with concrete of thickness shown on Drawings.

B. Replace nonconforming sections at no additional cost to Owner.

3.7 PROTECTION

A. Maintain newly place concrete in good condition until completion of Work.

B. Replace damaged areas.

END OF SECTION 32 13 13.25

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Joints for concrete paving; concrete sidewalks, concrete driveways, curbs, and curb and gutters.

B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

B. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

C. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

D. ASTM D 3405 - Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements.

E. TxDOT Tex-525-C - Tests for Asphalt and Concrete Joint Sealers.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit product data for joint sealing compound and proposed sealing equipment for approval.

C. Submit samples of dowel cup, metal supports, and deformed metal strip for approval. Submit manufacturer's recommendation for placing sealant(s).

PART 2 PRODUCTS

2.1 BOARD EXPANSION JOINT MATERIAL

A. Filler board of selected stock. Use wood of density and type as follows:

1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.
2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

2.2 PREFORMED EXPANSION JOINT MATERIAL

A. Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.

2.3 JOINT SEALING COMPOUND

A. Provide joint sealant as indicated on the drawings.

2.4 LOAD TRANSMISSION DEVICES

A. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. When indicated on Drawings, encase one end of dowel bar in approved cap having inside diameter 1/16 inch greater than diameter of dowel bar.

B. Deformed steel tie bars conforming to ASTM A 615, Grade 60.

2.5 SUPPORTS FOR REINFORCING STEEL AND JOINT ASSEMBLY

A. Employ supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by Owner's Representative.

PART 3 EXECUTION

3.1 PLACEMENT

A. When new Work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.

B. If limit of removal of existing concrete or asphalt pavement does not fall on existing joint, saw cut existing pavement minimum of 2 inches deep to provide straight, smooth joint surface without chipping, spalling, or cracks.

3.2 CONSTRUCTION JOINTS

A. Place transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints at interior edges of pavement lanes using No. 6 deformed tie bars, 30 inches long and spaced 18 inches on centers.

3.3 EXPANSION JOINTS

A. Place 3/4 inch expansion joints at radius points of curb returns for cross street intersections, or as located in adjacent pavement but no further than 80 feet apart or as shown on the drawings. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

3.4 CONTRACTION JOINTS

A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

3.5 LONGITUDINAL WEAKENED PLANE JOINTS

A. Place longitudinal weakened plane joints at spaces indicated on Drawings. If more than 15 feet in width is poured, longitudinal joint must be saw cut. Seal groove with joint sealing compound.

3.6 SAWED JOINTS

A. Use sawed joints as alternate to contraction and weakened plane joints. Use circular

cutter capable of cutting straight line groove minimum of 1/4 inch wide. Maintain depth of one quarter of pavement thickness. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, continue until completed. Make saw cut with one pass. Complete sawing within 24 hours of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.

B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

3.7 JOINTS FOR CURB, CURB AND GUTTER

A. Place 3/4 inch preformed expansion joints through curb and gutters at locations of expansion and contraction joints in pavement, at end of radius returns at street intersections and driveways, and at curb inlets. Maximum spacing shall be 120-foot centers.

3.8 JOINTS FOR CONCRETE SIDEWALKS

A. Provide 3/4 inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 40 feet.

3.9 JOINTS FOR CONCRETE DRIVEWAYS

A. Provide 3/4-inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. Extend expansion joint material full depth of slab.

3.10 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F and weather is not foggy or rainy.

B. Use joint sealing equipment in like new working condition throughout joint sealing operation, and be approved by Owner's Representative. Use concrete grooving machine or power- operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.

D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be 1/4 inch above level of adjacent surface or at elevation as directed.

3.11 PROTECTION

A. Maintain joints in good condition until completion of Work.

B. Replace damaged joints material with new material as required by this Section.

END OF SECTION 32 13 73

SECTION 32 16 13

CURBS AND GUTTERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforced concrete curb, reinforced monolithic concrete curb and gutter, and mountable curb.

B. Paving headers and railroad headers poured monolithically with concrete base or pavement.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit details of proposed form work for approval.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Division 32.

B. Reinforcing Steel: Conform to material requirements for welded wire fabric of Division 32.

C. Grout: Nonmetallic, nonshrink grout containing no chloride producing agents conforming to following requirements.

1. Compressive strength
   a. at 7 days: 3500 psi
   b. at 28 days: 4000 psi
2. Initial set time: 45 minutes
3. Final set time: 1.5 hours

D. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Division 32.

E. Expansion Joint Filler: Conform to material requirements for expansion joint filler of Division 32.

F. Mortar: Mortar finish composed of one part Portland cement and 1 1/2 parts of fine aggregate. Use only when approved by Owner's Representative.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare subgrade in accordance with applicable portions of sections on excavation and fill, embankment, and subgrade and roadbed.

3.2 PLACEMENT

A. Guideline: Set to follow top line of curb. Attach indicator to provide constant comparison between top

of curb and guideline. Ensure flow lines for monolithic curb and gutters conform to slopes indicated on Drawings.

B. Forms: Brace to maintain position during pour. Use metal templates cut to section shown on Drawings.

C. Reinforcement: Secure in position so that steel will remain in place throughout placement. Reinforcing steel shall remain at approximate center of base or pavement as indicated on Drawings.

D. Joints: Place in accordance with Division 32. Place dummy groove joints at to match concrete pavement joints at right angles to curb lines. Cut dummy grooves 1/4 inch deep using approved edging tool.

E. Place concrete in forms to required depth. Consolidate thoroughly. Do not permit rock pockets in form. Entirely cover top surfaces with mortar.

3.3 MANUAL FINISHING

A. After concrete is in place, remove front curb forms. Form exposed portions of curb, and of curb and gutter, using mule which conforms to curb shape, as shown on Drawings.

B. Thin coat of mortar may be worked into exposed face of curb using mule and two-handled wooden darby at least 3 feet long.

C. Before applying final finish move 10 foot straightedge across gutter and up curb to back form of curb. Repeat until curb and gutter are true to grade and section. Lap straightedge every 5 feet.

D. Steel trowel finish surfaces to smooth, even finish. Make face of finished curb true and straight.

E. Edge outer edge of gutter with 1/4 inch edger. Finish edges with tool having 1/4 inch radius.

F. Finish visible surfaces and edges of finished curb and gutter free from blemishes, form marks and tool marks. Finished curb or curb and gutter shall have uniform color, shape and appearance.

3.4 MECHANICAL FINISHING

A. Mechanical curb forming and finishing machines may be used instead of, or in conjunction with, previously described methods, when approved by Owner's Representative. Use of mechanical methods shall provide specified curb design and finish.

3.5 CURING

A. Immediately after finishing operations, cure exposed surfaces of curbs and gutters in accordance with Division 32.

3.6 TOLERANCES

A. Top surfaces of curb and gutter shall have uniform width and shall be free from humps, sags or other irregularities. Surfaces of curb top, curb face and gutter shall not vary more than 1/8 inch from edge of straightedge laid along them, except at grade changes.

3.7 PROTECTION

A. Maintain curbs and gutters in good condition until completion of Work.

B. Replace damaged curbs and gutters to comply with this Section.

END OF SECTION 32 16 13

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section specifies the requirements for providing pavement markings of the following types.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 QUALITY ASSURANCE

A. All markings shall comply with the requirements of the SDHPT Standard Specifications for Construction of Highways, Streets and Bridges, the SDHPT Manual on Uniform Traffic Control Devices for Streets and Highways and the applicable regulations and standards of Harris County, Texas and the City.

B. Reference Standards Applicable to this Section:

1. FS: Federal Specifications and Standards:

   a. TT-P-1952E: Paint, Traffic and Airfield Marking, Waterbourne

2. SDHPT: Texas State Department of Highways and Public Transportation:
   a. Standard Specifications for Construction of Highways, Streets and Bridges.
   b. Texas Manual on Uniform Traffic Control Devices for Streets and Highways (TMUTCD).
   c. The above referenced SDHPT standards may be obtained from:

3. State Department of Highways & Public Transportation Highway Building
4. 11th and Brazos Streets
5. Austin, Texas 78701
6. Tel: (512) 475-2081

1.4 SUBMITTALS

A. Certificates:

1. Certificates shall be submitted for each product indicating that the product complies with the requirements of this specification.

B. Manufacturer's Data:

1. Manufacturer's installation instructions, specifications and recommendations shall be submitted for each pavement marking product.

1.5 JOB CONDITIONS

A. Markings shall be installed only on clean and dry surfaces. Paint markings shall be applied only when surfaces have the following minimum temperatures:

1. A minimum of 50 degrees F for asphalt and a minimum of 60 degrees F for concrete.

PART 2 PRODUCTS

2.1 MATERIALS

A. Paint:

1. Marking paint shall be traffic white, yellow, or as designated on the drawings, and shall comply with the requirements of FS TT-P-1952E.

PART 3 EXECUTION

3.1 INSTALLATION

A. Markings shall be installed and surfaces prepared in accordance with the requirements of the applicable item in the SDHPT Standard Specifications and the TMUTCD.

B. Markings shall be protected from vehicular traffic until not subject to damage by such traffic. Contractor shall be responsible for repair and replacement of markings until written acceptance by the Owner.

END OF SECTION 32 17 23

SECTION 32 18 14

PAVED ELASTIC LAYER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Paved Elastic Layer.

B. Related Sections
1. Section 32 18 13.10 - Synthetic Grass Surfacing

PART 2 - PRODUCTS

2.1 PAVED ELASTIC LAYER

A. 19mm thick insitu pad of 1-5mm SBR rubber granules and mineral aggregates bound with moisture cured polyurethane binder. Rubber granules shall be placed at 18 lbs./sq.yd., pea gravel at 18 lbs./sq.yd., and binder at 2.9 lbs./sq.yd.

PART 3 - EXECUTION

3.1 PAVED ELASTIC LAYER

A. Elastic layer shall be pre-mixed and placed with a paving machine in one lift. Lift shall be placed starting at the crown of the field and laid running the length of the field from sideline to sideline.

B. All joints between passes shall be troweled and compacted by the paving machine operator as the material is placed.

C. All seams shall be hand rolled.

D. Locations where elastic layer abuts concrete perimeter curb shall be primed with a polyurethane primer.

E. Thickness - 19mm.

F. Elastic layer must cure for 48 hours prior to installation of the synthetic turf system.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 32 31 15

VINYL-CLAD CHAIN LINK FENCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide materials, equipment and labor to install vinyl clad chain link fencing and gates.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with Section 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include installation instructions for fence posts, fabric, gates, and accessories.

1.3 QUALITY ASSURANCE

A. Single-source Responsibility: Obtain chain link fences as complete units, including necessary erection accessories, fittings, and fastenings from a single source or manufacturer.

PART 2 - PRODUCTS

2.1 EXAMPLES OF ACCEPTABLE MANUFACTURERS

A. Provide vinyl-clad chain link fences and gates as manufactured by one of the following:
Allied Fence Manufacturing Co.
Ameristar Fence Products
Anchor Fence Div. Master-Halco, Inc.
Merchants Metals

2.2 MATERIALS AND CONSTRUCTION

A. Fabric: The chain link fabric shall be 8 gauge outside finish with 11 gauge galvanized steel core, vinyl clad both selvages knuckled. Provide 2” mesh typical. Color to be determined by Architect.

B. Top rail: 1⅝", vinyl clad. Color to be determined by Architect.

C. Terminal and Gate Posts: Terminal and Gate Posts shall be 2½" vinyl covered square tubing weighing 5.10 lbs. per lineal foot; or roll-formed section measuring 3½" having integral fabric loops weighing 5.14 lbs. per lineal foot or alternately TYPE I (See paragraph B) 2.875" O.D. steel round posts vinyl covered weighing 5.79 lbs. per lineal foot, or TYPE II (See paragraph B) 2.875" O.D. steel round posts vinyl covered weighing 4.64 lbs. per lineal foot. These posts shall not be splice welded in such a manner the weld appears above the grade line.

D. Terminal and Gate Post Fittings: Terminal and gate post fittings including tension bands, brace connections and top rail connections shall be No. 11 gauge, hot-dipped galvanized, cold-rolled carbon steel vinyl covered. No aluminum, cast iron, or pot-metal will be accepted as equals or substitutes. Top rail, brace and truss bands shall be vinyl covered and not less than 3/4" wide, secured by 5/16" diameter vinyl covered carriage bolts. Tension bars shall be vinyl covered and not be less than 3/16" by 3/4" and not less than 2" shorter than the nominal height of the fabric with which they are to be used. One tension bar shall be provided for each end and gate post, and two for each corner and pull post.

E. Gates: Gate width is shown on drawings. Frames shall be constructed of 2" vinyl covered square members weighing 2.72 lbs. per lineal foot or alternately of TYPE I (See paragraph B) 1.900" O.D. round steel pipe weighing 2.72 lbs. per lineal foot or TYPE II (See paragraph B) 1.900" O.D. round steel pipe vinyl covered weighing 2.281 lbs. per lineal foot. Gate frames shall be welded or alternately shall utilize corner fittings of heavy malleable iron or pressed steel securely riveted to the frame. Fabric matching the fence fabric shall be installed in the fame by means of tension bars and hook bolts. Frames having corner fittings shall be equipped with adjustable truss rods having a diameter of 3/8". Hinges shall be of adequate strength to support the gate and have large bearing surfaces for clamping in position. Under no conditions of use or abuse shall the hinges twist or turn under the action of the gate. Gates shall be capable of being opened and closed quickly and easily by one person. Gates shall be equipped with a positive latching device that

will accommodate padlocking. A plunger rod, catch and semi-automatic outer catch shall be installed on drive gates so as to secure gates in an open position. Hinges, latches and catches shall be one of the manufacturer's standard designs as selected and approved by the Architect.

F. Line posts and line post top: 2" vinyl clad. Color to be determined by Architect.

G. Terminal posts and terminal post top: 2½" vinyl clad. Color to be determined by Architect.

H. Bottom cable: No. 7 gauge galvanized steel vinyl clad. Color to be determined by Architect.

I. Ties: 11 gauge aluminum vinyl clad. Color to be determined by Architect

J. Concrete: Provide concrete consisting of Portland cement, ASTM C 150, aggregates ASTM C33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi. Use at least 4 sacks of cement per cu. Yd., 1-inch maximum size aggregate, a maximum 3-inch slump, and 2 to 4 percent entrained air.

2.3 Privacy Slats: provide high density polyethylene (HDPE) bottom-lock privacy slats as manufactured by PDS Fence Products. (Phone 800.822.7528, website www.pdsfence.com). Length shall be 3-1/2" shorter than the overall height of the fence. Color shall be as selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fence in compliance with ASTM F 567. Do not begin installation and erection before final grading is completed.

B. Excavation: Drill/hand-excavate with post-hole digger, holes for posts in firm, compacted soil.
1. Excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
2. Excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

C. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Refer to drawings for post spacing. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Extend concrete footings 2 inches above grade and trowel to a crown to shed water.

D. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

E. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 11-gage hog rings of same material and finish as fabric wire, spaced maximum 24 inches o.c.

F. Fabric: Leave approximately 2 inches between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

G. Tension or Stretcher Bars: Thread through or clamp to fabric 4 inches o.c., and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c.

H. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.
1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.

I. Privacy Slats:
1. Insert rail horizontally in first full diamond at bottom of fence with open side facing up.

2. Insert vertical slats with beveled/notched end downward. Slat engages and interlocks with bottom rail.
3. Push the vertical slat into the horizontal channel to lock in place.

3.2 PROTECTION AND CLEAN UP

A. Clean Up: Clean up all excess materials and dispose off premises. All excess materials are to become the property of the Contractor and shall be removed from the site at his expense.

END OF SECTION

--- THIS PAGE INTENTIONALLY BLANK ---

SECTION 32 31 19

DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Ornamental metal fencing.

B. Related Sections:
1. Section 31 23 00 - Earthwork.
2. Section 03 33 00 - Cast-In-Place Concrete

1.2 SUBMITTALS

A. General: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: Include construction details, materials descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Show locations of fences, post, rails, and accessories. Include plans, fence elevation, sections, details of post anchorage, and other required installation clearances.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed ornamental metal fences and gates similar in material, design, and extent to those indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

1.4 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft.

1.5 WARRANTY

A. Warrant the work specified herein for 20 years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship. Include a 5 year labor warranty. Defects shall include, but not limited to, the following:
1. Cracking
2. Peeling
3. Blistering
4. Corroding
5. Failure of mechanical parts or assemblies

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Provide Montage II, Majestic, ornamental metal fencing system as manufactured by Ameristar Perimeter Security, (phone 888.333.3422 web site: https://www.ameristarperimeter.com/us/en) or approved equivalent.

2.2 MATERIALS

A. Materials for fence framework (i.e., pickets, rails, and posts) shall be manufactured from coil steel having a minimum yield strength of 50,000 psi. The steel shall be galvanized to meet the requirements of ASTM A 526 with a minimum zinc coating weight of 0.90 ounces per square foot (coating Designation G-90), hot-dip process. Galvanized framework shall be subject to a six stage pretreatment/wash (with zinc phosphate)

followed by "PERMACOAT™", an electrostatic spray application of a two-coat powder system. Color shall be as selected by Architect.

B. Material for fence:
   1. Pickets shall be minimum 1” sq x 14 ga. tubing.
   2. Rails shall be 1.75” x 1.75” with a minimum thickness of 12 ga.
   3. Posts shall be 2.5” sq [3” sq] x 12 ga.
   4. Height as shown in drawings.

2.3 SWING GATES

A. Pedestrian Swing Gates.
   1. Gate Configuration: As indicated.
   2. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes 2 by 2 inches formed from 0.108-inch nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch nominal-thickness steel sheet and hot-dip galvanized after fabrication.
      a. Frame Corner Construction: Welded and 5/16-inch-diameter, adjustable truss rods for panels 5 feet wide or wider.
   3. Infill: Match adjacent fence with the addition of galvanized 3/4" No. 16 Flattened expanded steel mesh.
   4. Hardware:
      a. Exit Device: As indicated on Hardware Schedule.
      b. Hinge/Closer: Integrated hinge-closer set shall be ADA compliant that shall include a variable speed and final snap adjustment mounted with tamper-resistant security fasteners, with full range of adjustability.

2.4 FABRICATION

A. Pickets, rails, and posts shall be precut to specified lengths. Ornamental metal fence shall be factory-fabricated in sections.

B. All components of ornamental metal fence shall be factory finished after fabrication.

PART 3 - EXECUTION

3.1 PREPARATION

A. Stake locations of fence lines and terminal posts. Indicate locations of utilities, lawn sprinkler system, and underground structures.

3.2 INSTALLATION

A. General: Install ornamental metal fences in strict compliance with manufacturer’s written instructions and recommendations.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings as recommended by manufacturer.

C. Post Setting: Set posts in concrete.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete.
   2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter. Extend concrete 2 inches above grade; shape and smooth to shed water.

D. Panels shall be attached to posts using panel brackets and bolt-on hardware supplied by manufacturer.

3.3 CLEANING

A. Contractor shall clean the jobsite of excess materials; post hole excavations shall be scattered uniformly away from posts.

END OF SECTION

SECTION 32 33 05

ARCHITECTURAL SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide and install the following:
   1. Handicapped parking signs.
   2. Traffic directional signs.
   3. Removable Pipe Bollards.

B. Related Sections:
   1. Section 32 13 13 - Concrete Paving.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
   1. Include catalog, cuts of each type of sign and manufacturer's installation instructions.

B. Samples: Submit manufacturer’s samples of materials, finishes, and colors for fixed tables and seats.

C. Shop Drawings: Submit a complete seating plan developed from the drawings showing chairs, and sizes.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle signs in accordance with SECTION 01 65 00 - PRODUCT DELIVERY REQUIREMENTS and SECTION 01 66 00 - PRODUCT STORAGE AND HANDLING REQUIREMENTS

B. Store in manufacturer's cartons.

C. Store off ground on planking.

D. Cover with non-staining plastic.

1.4 PROJECT CONDITIONS

A. Coordinate installation of site furnishings with work of other trades.

PART 2 - PRODUCTS

2.1 MATERIALS/PRODUCTS

A. Site signs: As manufactured by Sa-So (Sargent-Sowell, Inc.) 1185 108th Street, Grand Prairie, Texas 75050 (phone 647-1525), or approved equivalent.
   1. General: Site signs shall be of the quality manufactured by Sa-So and are listed by Sa-So catalog numbers for convenience in identification.
   2. Aluminum Sheets: ASTM B209, alloy 6061 T6, degreased and etched, 0.080" thickness. Sign faces shall be fully reflectorized with material conforming to Mil. Spec. MIL-R-13689A.
   3. Bolts, Nuts, Washers, and Clamps: Cadmium or galvanized steel. Bolts shall be a minimum of 5/16" in diameter. Clamps shall be two-piece assemblies of at last 14 gage steel or shall be an adjustable steel strap bracket.
   4. Posts: Standard galvanized steel pipe 2-3/8" in diameter and weighing not less than 2 lbs. per linear foot.

5. Concrete: Provide concrete consisting of Portland cement (ASTM C150/C150M), aggregates (ASTM C33/C33M), and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi, using at least 4 sacks of cement per cubic yard, 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

B. Embedded Removable Pipe Bollards: Provide “QuickKore Removable Bollard”, with padlock receiver and lid to cover the empty embedment sleeve, for round pipe bollards as manufactured by Calpipe Security/Atkore (708-516-7603), or one of the following manufacturers:
   Columbia Cascade Company (1-800-547-1940)
   Dawn Enterprises (1-866-671-4021)
1. Fabrication: 6-inch ID, 0.280-inch wall, Schedule 40 steel pipe.
2. Height: Reference drawings.
3. Top: Domed.
4. Mounting: Removable embedded, pad lockable.
5. Finish: Hot-dipped galvanized.
6. Accessories: Pad lockable or integral hole covers for removable bollards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Site Sign Materials:
1. Excavation: Drill holes of the size indicated for posts. Excavate holes to the depths indicated. Remove excess concrete and excavated soil from the site.
2. Setting Posts:
   a. Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete. Center and align posts in holes.
   b. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Trowel finish tops of footings, and slope or dome to direct water away from posts.
3. Attach signs to posts with bolts, washers, nuts and clamps.

3.2 CLEANING

A. Remove crates, cartons and rubbish after installation.

B. Clean exposed sign faces and galvanized surfaces, and leave free of defects. Use no abrasives. Leave pavement and graded area clean and free of debris.

END OF SECTION

SECTION 32 91 13.13

TOPSOIL PLACEMENT AND GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnishing and placing topsoil for finish grading and for seeding, sodding, and planting in areas other than designated athletic fields.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Topsoil shall be fertile, friable, natural sandy loam surface soil obtained from excavation or borrow operations having following characteristics:

1. pH value of between 5.5 and 6.5
2. Liquid limit: 50 or less
3. Plasticity index: 20 or less
4. Gradation: maximum of 10 percent passing No. 200 sieve

B. Topsoil shall be reasonably free of subsoil, clay lumps, weeds, non-soil materials, and other litter or contamination. Topsoil shall not contain roots, stumps, and stones larger than 2 inches.

C. Obtain topsoil from naturally well-drained areas where topsoil occurs at minimum depth of 4 inches and has similar characteristics to that found at placement site. Do not obtain topsoil from areas infected with growth of, or reproductive parts of nut grass or other noxious weeds.

PART 3 EXECUTION

3.1 EXAMINATION

A. Excavate topsoil for esplanades and areas to receive grass or landscaping from areas to be further excavated. Stockpile in area approved by Owner's Representative.

B. Stockpile topsoil to depth not exceeding 8 feet. Cover to protect from erosion.

3.2 TOPSOIL EXCAVATION

A. Conform to excavation and stockpiling requirements of Division 31.

3.3 PLACEMENT

A. Place no topsoil until subgrade has been approved. For areas to be seeded or sodded, scarify or plow existing material to minimum depth of 4 inches, or as indicated on Drawings. Remove vegetation and foreign inorganic material. Place 4 inches of topsoil on loosened material and roll lightly with appropriate lawn roller to consolidate topsoil.

B. Increase depth of topsoil to 6 inches when placed over sand bedding and backfill materials specified in Division 31.

C. For areas to receive shrubs or trees, excavate existing material and place topsoil to depth and dimensions shown on Drawings.

D. Remove spilled topsoil from curbs, gutters, and, paved areas and dispose of excess topsoil in accordance with requirements of Division 1.

E. Place topsoil to promote good drainage and compact with light roller. Water topsoil after placement until saturated for minimum depth 6 inches, fill in and recompact areas of settlement.

3.4 PROTECTION

A. Protect topsoil from wind and water erosion until planting is completed.

END OF SECTION 32 91 13.13

SECTION 33 05 13

MANHOLES AND STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Precast concrete manholes for sanitary sewers, storm sewers, and water lines.
B. Precast concrete sanitary sewer manholes with PVC liner where corrosion resistant manholes.
C. Pile-supported concrete foundation used for unstable subgrade treatment for manhole base.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASME B 16.1 -Cast Iron Pipe Flanges and Flanged Fittings

B. ASTM A 307 -Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile

C. ASTM A 615 -Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

D. ASTM C 270-Standard Specification for Mortar for Unit Masonry

E. ASTM C 443 -Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

F. ASTM C 478 -Standard Specification for Precast Reinforced Concrete Manhole Sections

G. ASTM C 923 -Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

H. ASTM C 1107 -Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

I. ASTM D 698 -Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/fr')

J. ASTM D 2665 -Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

K. ASTM D 2996 -Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber- Reinforced Thermosetting-Resin) Pipe.

L. ASTM D 2997 -Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber- Reinforced Thermosetting Resin) Pipe

M. AWWA C 213 -Standard for Fusion Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines

N. American Association of State Highway and Transportation Officials (AASHTO)

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit manufacturer's data and details of following items for approval:
   1. Shop drawings of manhole sections, base units and construction details, including reinforcement, jointing methods, materials and dimensions.
   2. Summary of criteria used in manhole design including, as minimum, material properties, loadings, load combinations, and dimensions assumed. Include certification from manufacturer that precast manhole design is in full accordance with ASTM C 478 and design criteria as established in Paragraph 2.01E of this Specification.
   3. Frames, grates, rings, and covers
   4. Materials to be used in fabricating drop connections
   5. Materials to be used for pipe connections at manhole walls
   6. Materials to be used for stubs and stub plugs, if required
   7. Materials and procedures for corrosion-resistant liner and coatings, if required.
   8. Plugs to be used for sanitary sewer hydrostatic testing
   9. Manufacturer's data for pre-mix (bag) concrete, if used for channel inverts and benches

C. Seal submittal drawings by Professional Engineer registered in State of Texas.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE MANHOLES

A. Provide manhole sections, base sections, and related components conforming to ASTM C 478. Provide base riser section with integral floors, unless shown otherwise. Provide adjustment rings which are standard components of manufacturer of manhole sections. Mark date of manufacture and name or trademark of manufacturer on inside of barrel.

B. Construct barrels for precast manholes from standard reinforced concrete manhole sections of diameter indicated on Drawings. Use various lengths of manhole sections in combination to provide correct height with fewest joints. Design wall sections for depth and loading conditions in Paragraph 2.01 E, with minimum thickness of 5 inches. Base section shall have minimum thickness of 12 inches under invert.

C. Provide tops to support HS-20 vehicle loading, and receive cast iron frame covers, as indicated on Drawings.

D. Where manholes larger than 48-inch diameter are indicated on Drawings, provide precast base sections with flat slab top precast sections used to transition to 48-inch diameter manhole access riser sections. Transition can be concentric or eccentric unless otherwise shown on Drawings. Locate transition to provide minimum of 7-foot head clearance from base to underside of transition unless otherwise approved by Owner's Representative.

E. Design Loading Criteria: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed, by manufacturer, to requirements of ASTM C 478 for depth as shown on Drawings and to resist following loads.

   1. AASHTO HS-20 vehicle loading applied to manhole cover and transmitted down to transition and base slabs
   2. Unit soil weight of 120 pcf located above portions of manhole, including base slab projections
   3. Lateral soil pressure based on saturated soil conditions producing an at-rest equivalent fluid pressure of 100 pcf
   4. Intemalliquid pressure based on unit weight of 63 pcf
   5. Dead load of manhole sections fully supported by transition and base slabs

F. Design: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed according to requirements of ASTM C 478 and following:

1. Design additional reinforcing steel to transfer stresses at openings. Area of steel to be no less than shown on Drawings.
2. Wall loading conditions:
   a. Saturated soil pressure acting on empty manhole
   b. Manhole filled with liquid to a halfway depth as measured from invert to cover, with no balancing external soil pressure
3. Minimum clear distance between two wall penetrations shall be 12 inches or half diameter of smaller penetration, whichever is greater

G. Provide joints between sections with o-ring gaskets conforming to ASTM C 443.

H. When base is cast monolithic with portion of vertical section, extend reinforcing in vertical section into base.

I. Precast Concrete Base: Suitable cutouts or holes to receive pipe and connections. Lowest edge of holes or cutouts: For water line manhole, no less than 6 inches above inside surface of floor of base.

2.2 CONCRETE

A. Conform to requirements of Division 32.

B. Channel Inverts: Use 5 sack premix (bag) concrete or Class A concrete for inverts not integrally formed with manhole base, with minimum compressive strength of 4000 psi.

C. Cement Stabilized Sand Foundation: Provide cement stabilized sand foundation under base section in lieu of foundation slab, as shown on Drawings, conforming to requirements of Division 31.

D. Concrete Foundation: Provide Class A concrete with minimum compressive strength of 4000 psi for concrete foundation slab under manhole base section where indicated on Drawings.

2.3 REINFORCING STEEL

A. Conform to requirements of Division 32.

2.4 MORTAR

A. Conform to requirements of City of Houston Standard Specifications Section 04061 - Mortar.

2.5 MISCELLANEOUS METALS

A. Provide cast-iron frames, rings, and covers conforming to requirements of Division 33.

2.6 DROP CONNECTIONS AND STUBS

A. Provide drop connections and stubs conforming to same pipe material requirements used in main pipe, unless otherwise indicated on Drawings.

2.7 PIPE CONNECTIONS TO MANHOLE

A. Sanitary Sewers.

1. Provide resilient connectors conforming to requirements of ASTM C 923. Use the following materials for metallic mechanical devices as defined in ASTM C 923:
   a. External clamps: Type 304 stainless steel
   b. Internal, expandable clamps on standard manholes: Type 304 stainless steel, 11 gauge

minimum.

c. Internal, expandable clamps on corrosion-resistant manholes:
   1) Type 316 stainless steel, 11 gauge minimum
   2) Type 304 stainless steel, 11 gauge minimum, coated with minimum 16 mil fusion-bonded epoxy conforming to AWWA C 213

2. Where rigid joints between pipe and cast-in-place manhole base are specified or shown on Drawings, provide polyethylene-isoprene water-stop meeting physical property requirements of ASTM C 923, such as Press-Seal WS Series, or approved equal.

B. Storm Sewer Connections:

1. Provide watertight connections in accordance with ASTM C 923.

C. Water Lines

1. Where smooth exterior pipes, i.e., steel, ductile iron, or PVC pipes are connected to manhole base or barrel, seal space between pipe and manhole wall with assembly consisting of rubber gasket or links mechanically compressed to form a watertight barrier. Assemblies: Press-Wedge, Res-Seal, Thunderline Link-Seal, or approved equal. See Drawings for placement of assembly in manhole sections.
2. When connecting concrete or cement mortar coated steel pipes, or as option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of a stainless steel power sleeve, stainless steel take-up clamp and a rubber gasket. Take-up clamp: Minimum of 9/16 inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

2.8 SEALANT MATERIALS

A. Provide sealing materials between precast concrete adjustment ring and manhole cover frame, Adeka Ultraseal P201, or approved equal.

B. Provide approved external sealing material from Canusa Wrapid Seal manhole encapsulation system, or approved equal.

C. Provide Butyl Sealant: Provide Press-Seal EZ Stick, or equal, for HDPE rings.

2.9 CORROSION RESISTANT MANHOLE MATERIALS

A. Where corrosion-resistant manholes or PVC-lined manholes are indicated on Drawings, provide one of following:

1. PVC liner for precast cylindrical manhole section, base sections, and cone sections in accordance with Division 33.
2. Precast base sections, as specified above, lined with PVC or equal and fiberglass manholes in accordance with Division 33.

2.10 BACKFILL MATERIALS

A. Conform to requirements of Division 31.

2.11 NON-SHRINK GROUT

A. Provide prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only addition of water.

B. Meet requirements of ASTM C 1107 and have minimum 28-day compressive strength of 7000 psi.

2.12 VENT PIPES

A. Provide external vent pipes for manholes where indicated on Drawings.

B. Buried Vent Pipes: Provide 3 inch or 4 inch PVC DWV pipe conforming to ASTM D 2665. Alternatively, provide FRP pipe as specified for vent outlet assembly.

C. Vent Outlet Assembly: Provide vent outlet assembly as shown on Drawings, constructed of following specified materials:

1. FRP Pipe: Provide filament wound FRP conforming to ASTM D 2996 or centrifugally cast FRP conforming to ASTM D 2997. Seal cut ends in accordance with manufacturer's recommendations.
2. Joints and Fittings: Provide epoxy bodied fittings and join pipe to fittings with epoxy adhesive
3. Flanges: Provide socket-flange fittings for epoxy adhesive bonding to pipe ends where shown on Drawings. Meet bolt pattern and dimensions for ASME B 16.1, 125-pound flanges. Flange bolts shall be Type 304 stainless steel or hot-dip zinc coated, conforming to ASTM A 307, Class A or B.
4. Coating: Provide approved 2-component, aliphatic polyurethane coating using primer or tie coat recommended by manufacturer. Provide two or more coats to yield dry film thickness of at least 3 mils. Color shall be selected by The Engineer from manufacturer's standard colors.

2.13 PROHIBITED MATERIALS

A. Do not use brick masonry for construction of manholes, including adjustment of manholes to grade unless approved by the Engineer. Use only specified materials listed above.

2.14 MANHOLE LADDER FOR WATERLINE MANHOLES

A. Manhole Ladder: Fiberglass with 300-lb rating at appropriate length; conform to requirements of Occupational Safety and Health Standards (OSHA), U.S. Department of Labor except where shown on Drawings.

1. Use components, including rungs, made of fiberglass, fabricated with nylon or aluminum rivets and/or epoxy. Apply non-skid coating to ladder rungs. Mount ladder using manufacturer's recommended hardware.
2. Provide ladder as manufactured by Saf-Rail or approved equal. Locate ladder as shown on Drawings.
3. Fiberglass: Premium type polyester resin, reinforced with fiberglass; constructed to provide complete wetting of glass by resin; resistant to rot, fungi, bacterial growth and adverse effects of acids, alkalis and residential and industrial waste; yellow in color.
4. Provide approved petroleum-based tape encapsulating bolts in access manhole.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that lines and grades are correct.

B. Determine if subgrade, when scarified and recompacted, can be compacted to 95 percent of maximum Standard Proctor Density according to ASTM D 698 prior to placement of foundation material and base section. When proper density is not reached, moisture condition subgrade until that density is reached or treat as unstable subgrade.

C. Do not build manholes in ditches, swales, or drainage paths unless approved by the Engineer.

3.2 PLACEMENT

A. Install precast manholes to conform to locations and dimensions shown on Drawings.

B. Place sanitary and storm manholes at points of change in alignment, grade, size, pipe intersections, and end of sewer unless otherwise shown on Drawings.

3.3 MANHOLE BASE SECTIONS AND FOUNDATIONS

A. Place precast base on 12 inch thick (minimum) foundation of crushed stone wrapped in filter fabric, cement stabilized sand, or concrete foundation slab. Compact cement-sand in accordance with requirements of Division 2.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify the Engineer for examination of subgrade to determine if subgrade has heaved upwards after being excavated. When heaving has not occurred, over-excavate subgrade to allow for 24 inch-thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base. When there is evidence of heaving, provide pile-supported concrete foundation, as detailed on Drawings, under manhole base.

3.4 PRECAST MANHOLE SECTIONS

A. Install sections, joints, and gaskets in accordance with manufacturer's printed recommendations.

B. Install precast adjustment rings above tops of cones or flat-top sections as required to adjust finished elevation and to support manhole frame.

C. Seal any lifting holes with non-shrink grout.

D. Where PVC liners are required, seal joints between sections in accordance with manufacturer's recommendations.

E. Place at least two precast concrete grade rings with thickness of 12 inches or less, under casting.

3.5 PIPE CONNECTIONS AT MANHOLES

A. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.

1. Where smooth exterior pipes, i.e. steel, ductile iron or PVC pipes are connected to manhole base or barrel, space between pipe and manhole wall shall be sealed with an assembly consisting of rubber gaskets or links mechanically compressed to form watertight barrier. Assemblies: "Press-Wedge," "Res-Seal," "Thunderline Link-Seals," or approved equal. See Drawings for placement of assembly in manhole sections.
2. When connecting concrete or cement mortar coated steel pipes, or as an option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of stainless steel power sleeve, stainless steel take-up clamp and rubber gasket. Take-up clamp: Minimum of9/16 inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

B. Grout storm sewer connections to manhole unless otherwise shown on Drawings. Grout pipe penetration in place on both inside and outside of manhole.

C. Ensure no concrete, cement stabilized sand, fill, or other rigid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on either interior or exterior of manhole. If necessary, fill space with compressible material to ensure full flexibility provided by resilient connector.

D. Where new manhole is constructed on existing sewer, rigid joint pipe may be used. Install waterstop gasket around existing pipe at center of cast-in-place wall. Join ends of split waterstop material at pipe springline using an adhesive recommended and supplied by waterstop manufacturer.

E. Test connection for watertight seal before backfilling.

3.6 INVERTS FOR SANITARY SEWERS

A. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:

1. Slope of invert bench: 1 inch per foot minimum; 1-1/ 2 inches per foot maximum
2. Depth of bench to invert:
   a. Pipes smaller than 15 inches: one-half of largest pipe diameter
   b. Pipes 15 to 24 inches: three-fourths of largest pipe diameter
   c. Pipes larger than 24 inches: equal to largest pipe diameter
3. Invert slope through manhole: 0.10 foot drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on Drawings.

B. Form invert channels with concrete if not integral with manhole base section. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

3.7 DROP CONNECTIONS FOR SANITARY SEWERS

A. Backfill drop assembly with crushed stone wrapped in filter fabric, cement stabilized sand, or Class A concrete to form solid mass. Extend cement stabilized sand or concrete encasement minimum of four (4) inches outside bells.

B. Install drop connection when sewer line enters manhole higher than 30 inches above invert of manhole.

3.8 STUBS FOR FUTURE CONNECTIONS

A. In manholes, where future connections are indicated on Drawings, install resilient connectors and pipe stubs with approved watertight plugs.

3.9 MANHOLE FRAME AND ADJUSTMENT RINGS

A. Combine precast concrete adjustment rings so elevation of installed casting cover matches pavement surface. Seal between concrete adjustment ring and precast top section with nonshrink grout; do not use mortar between adjustment rings. Apply latex-based bonding agent to precast concrete surfaces joined with non-shrink grout. Set cast iron frame on adjustment ring in bed of approved sealant material. Install sealant bed consisting of two beads of sealant, each bead having minimum dimensions of 1/2-inch and 1/2-inch wide.

B. Wrap manhole frame and adjustment rings with external sealing material, minimum 3 inches beyond joint between ring and frame and adjustment rings and precast section.

C. For manholes in unpaved areas, set top of frame minimum of 6 inches above existing ground line unless otherwise indicated on Drawings. In unpaved areas, encase manhole frame in mortar or non-shrink grout placed flush with face of manhole ring and top edge of frame. Provide rounded comer around perimeter.

3.10 BACKFILL

A. Place and compact backfill materials in area of excavation surrounding manholes in

accordance with requirements of Division 31. Provide embedment zone backfill material, as specified for adjacent utilities, from manhole foundation up to an elevation 12 inches over each pipe connected to manhole. Provide trench zone backfill, as specified for adjacent utilities, above embedment zone backfill.

B. Where rigid joints are used for connecting existing sewers to manhole, backfill under existing sewer up to springline of pipe with Class B concrete or flowable fill.

C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide minimum of 4 inches of topsoil conforming to requirements of Division 32. When shown on Drawings, sod disturbed areas in accordance with Division 32.

3.11 FIELD QUALITY CONTROL

A. Conduct leakage testing of sanitary sewer manholes in accordance with requirements of Division 33.

3.12 PROTECTION

A. Protect manholes from damage until work has been accepted. Repair damage to manholes at no additional cost to the Owner.

END OF SECTION 33 0513

SECTION 33 05 16.13

PRECAST CONCRETE UTILITY STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Precast concrete inlets for storm or sanitary sewers, including cast iron frame and plate or grate.

B. Precast concrete headwalls and wingwalls for storm sewers.

C. Precast junction box with lid or grate top.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit shop drawings for approval of design and construction details for precast concrete inlets, junction box headwalls, and wingwalls. Precast units differing from standard designs shown on Drawings will be rejected unless shop drawing submittals are approved. Clearly show proposed substitution is equal or superior in every aspect to standard designs.

C. Submit manufacturers' data and details for frames, grates, rings, and covers.

1.5 STORAGE AND SHIPMENT

A. Store precast units on level blocking. Do not place loads until design strength is reached. Shipment of acceptable units may be made when 28-day strength requirements have been met.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete: Provide concrete for precast machine-made units meeting requirements of ASTM C 76 regarding reinforced concrete, cement, aggregate, mixture, and concrete test. Minimum 28-day compressive strength shall be 4,000 psi.

B. Reinforcing Steel: Place reinforcing steel to conform to details shown on Drawings and as follows:
1. Provide positive means for holding steel cages in place throughout production of concrete units. Maximum variation in reinforcement position is plus or minus 10 percent of wall thickness or plus or minus 1/2 inch, whichever is less. Regardless of variation, maintain minimum cover of concrete over reinforcement as shown on Drawings.
2. Welding of reinforcing steel is not permitted unless noted on Drawings.

C. Mortar and Hydraulic Cement: Conform to requirements of Division 32.

D. Miscellaneous Metal: Cast-iron frames and plates conforming to requirements of Division 33.

2.2 SOURCE QUALITY CONTROL

A. Tolerances: Allowable casting tolerances for concrete units are plus or minus 1/4 inch from dimensions shown on Drawings. Concrete thickness in excess of that required will not constitute cause for rejection provided that excess thickness does not interfere with proper jointing operations.

B. Precast Unit Identification: Mark date of manufacture and name or trademark of manufacturer clearly on inside of inlet, headwall, or wingwall.

C. Rejection: Precast units rejected for non-conformity with these specifications and for following reasons:

1. Fractures or cracks passing through shell, except for single end crack that does not exceed depth of joint.
2. Surface defects indicating honeycombed or open texture.
3. Damaged or misshaped ends, where damage would prevent making satisfactory joint.

D. Replacement: Immediately remove rejected units from Work site and replace with acceptable units.

E. Repairs: Occasional imperfections resulting from manufacture or accidental damage may be repaired if, in opinion of Owner's Representative, repaired units conform to requirements of these specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines and grades are correct.

B. Verify compacted subgrade will support loads imposed by inlets.

3.2 INSTALLATION

A. Install units complete in place to dimensions, lines, and grades as shown on Drawings.

B. Excavate in accordance with requirements of Division 31.

C. Bed precast concrete units on foundations of firm, stable material shaped to conform to shape of unit bases.

D. Provide adequate means to lift and place concrete units.

3.3 FINISHES

A. Use hydraulic cement to seal joints, fill lifting holes and as otherwise required.

B. When box section of inlet has been completed, shape floor of inlet with mortar to conform to Drawing details.

C. Adjust cast iron inlet plate frames to line, grade, and slope shown on Drawings. Grout frame in place with mortar.

3.4 INLET WATERTIGHTNESS

A. Verify that inlets are free of leaks. Repair leaks in approved manner.

3.5 CONNECTIONS

A. Connect storm sewer leads to inlets as shown on Drawings. Seal connections inside and outside with hydraulic cement. Make connections watertight.

3.6 BACKFILL

A. Backfill area of excavation surrounding each completed inlet, headwall, or wingwall according to requirements of Division 31.

END OF SECTION 33 05 16.13

SECTION 33 05 16.16

CONCRETE FOR UTILITY CONSTRUCTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete work for utility construction or rehabilitation, such as slabs on grade, small vaults, site-cast bases for precast units, and in-place liners for manhole rehabilitation.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ACI 117 - Standard Tolerances for Concrete Construction and Materials.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

E. ACI 308 - Standard Practice for Curing Concrete.

F. ACI 309R - Guide for Consolidation of Concrete.

G. ACI 311 - Guide for Concrete Plant Inspection and Field Testing of Ready-Mix Concrete.

H. ACI 315 - Details and Detailing of Concrete Reinforcement.

I. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

J. ACI 544 - Guide for Specifying, Mixing, Placing, and Finishing Steel Fiber Reinforced Concrete.

K. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

L. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

M. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

N. ASTM A 767 - Standard Specifications for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

O. ASTM A 775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

P. ASTM A 820 - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.

Q. ASTM A 884 - Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

R. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

S. ASTM C 33 - Standard Specification for Concrete Aggregates.

T. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

U. ASTM C 42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

V. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

W. ASTM C 138 - Standard Test Method for Unit Weight Yield and Air Content (Gravimetric) of Concrete.

X. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

Y. ASTM C 150 - Standard Specification for Portland Cement.

Z. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

AA. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method.

BB. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

CC. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

DD. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

EE. ASTM C 494- StandardSpecification for Chemical Admixtures for Concrete.

FF. ASTM C 595- StandardSpecificationfor Blended Hydraulic Cements.

GG. ASTM C 685- StandardSpecification for Concrete Made by Volumetric Batchingand Continuous Mixing.

HH. ASTM C 1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

II. ASTM C 1077 - Standard Practice for Laboratory Testing of Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation.

JJ. CRSI MSP-1 - Manual of Standard Practice.

KK. CRSI - Placing Reinforcing Bars.

LL. Federal Specification SS-S-210A - Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

MM. NRMCA - Concrete Plant Standards.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit proposed mix design and test data for each type and strength of concrete in Work.

C. Submit laboratory reports prepared by independent testing laboratory stating that materials used comply with requirements of this Section.

D. Submit manufacturer's mill certificates for reinforcing steel. Provide specimens for testing when required by Owner's Representative.

E. Submit certification from concrete supplier that materials and equipment used to produce and deliver concrete comply with this Specification.

F. When required on Drawings, submit shop drawings showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details, and other pertinent information.

G. For waterstops, submit product information sufficient to indicate compliance with this Section, including manufacturer's descriptive literature and specifications.

1.5 HANDLING AND STORAGE

A. Cement: Store cement off of ground in well-ventilated, weatherproof building.

B. Aggregate: Prevent mixture of foreign materials with aggregate and preserve gradation of aggregate.

C. Reinforcing Steel: Store reinforcing steel to protect it from mechanical injury and formation of rust. Protect epoxy-coated steel from damage to coating.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Material:
1. Portland Cement: ASTM C 150, Type II, unless use of Type III is authorized by Owner's Representative; or ASTM C 595, Type IP. For concrete in contact with sewage use Type II cement.
2. When aggregates are potentially reactive with alkalis in cement, use cement not exceeding 0.6 percent alkali content in form of Na2O + 0.658K20.

B. Water: Clean, free from harmful amounts of oils, acids, alkalis, or other deleterious substances, and meeting requirements of ASTM C 94.

a. Addition Rate: 1.5 pounds of fiber per cubic yard of concrete.
b. Physical Properties:
1) Material: Polypropylene
2) Length: 1/2 inch or graded
3) Specific Gravity: 0.9l
c. Acceptable Manufacturer: W. R. Grace Company, Fibermesh, or approved equal.
2. Steel Fiber: Comply with applicable provisions of ACI 544 and ASTM A 820.

1. Fiber: Fibrillated Polypropylene Fiber:
a. Ratio: 50 to 200 pounds of fiber per cubic yard of concrete.
b. Physical Properties:
1) Material: Steel
2) Aspect Ratio (for fiber lengths of 0.5 to 2.5 inch, length divided by diameter or equivalent diameter): 30:1 to 100:1
3) Specific Gravity: 7.8
4) Tensile Strength: 40-400 ksi.
5) Young's Modulus: 29,000 ksi Minimum Average Tensile Strength: 50,000 psi Bending Requirements: Withstand bending around 0.125-inch diameter mandrel to angle of 90 degrees, at temperatures not less than 60 degrees F, without breaking

6) Curing Compounds: Type 2 white-pigmented liquid membrane-forming compounds conforming to ASTM C 309.

2.2 FORM WORK MATERIALS

A. Lumber and Plywood: Seasoned and of good quality, free from loose or unsound knots, knot holes, twists, shakes, decay and other imperfections which would affect strength or impair finished surface of concrete. Use S4S lumber for facing or sheathing. Forms for bottoms of caps: At least 2 inch (nominal) lumber or 3/4 inch form plywood backed adequately to prevent misalignment. For general use, provide lumber of 1-inch nominal thickness or form plywood of approved thickness.

B. Form work for Exposed Concrete Indicated to Receive Rubbed Finish: Form or form-lining surfaces free of irregularities; plywood of 1/4 inch minimum thickness, preferably oiled at mill.

C. Chamfer Strips and Similar Moldings: Redwood, cypress, or pine that will not split when nailed and which can be maintained to true line. Use mill-cut molding dressed on all faces.

D. Form Ties: Metal or fiberglass of approved type with tie holes not larger than 7/8 inch in diameter. Do not use wire ties or snap ties.

E. Metal Forms: Clean and in good condition, free from dents and rust, grease, or other foreign materials that tend to disfigure or discolor concrete in gauge and condition capable of supporting concrete and construction loads without significant distortion. Countersink bolt and rivet heads on facing sides. Use only metal forms which present smooth surface and which line up properly.

2.3 PRODUCTION METHODS

A. Use either ready-mixed concrete conforming to requirements of ASTM C 94, or concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685.

2.4 MEASUREMENT OF MATERIALS

A. Measure dry materials by weight, except volumetric proportioning may be used when concrete is batched and mixed in accordance with ASTM C 685.

Classification:

Class	Type	Minimum Compressive Strength (LBS/Sq.In.)		Miximum W/C Ratio	Air Content (Percent)	Consistency Range in Slump (Inches)
		7-Day	28-Day			
A	Structural	3200	4000	0.45	4 + 1	2 to 4*
B	Pipe Block Fill, Thrust Block	_	1500	---	4 + 1	5 to 7

*When ASTM C 494, Types F or Type G admixture is used to increase workability, this range may be 6 to 9.

B. Measure water and liquid admixtures by volume.

2.5 DESIGN MIX

A. Use design mixes prepared by certified testing laboratory in accordance with ASTM C 1077 and conforming to requirements of this section.

B. Proportion concrete materials based on ACI 211.1 to comply with durability and strength requirements of ACI 318, Chapters 4 and 5, and this specification. Prepare mix design of Class A concrete so minimum cementitious content is 564 pounds per cubic yard. Submit concrete mix designs to Owner's Representative for review.

C. Proportioning on basis of field experience or trial mixtures in accordance with requirements at Section 5.3 of ACI 318 may be used, when approved by Owner's Representative.

D. Add steel or polypropylene fibers only when called for on Drawings or in another section of these Specifications.

E. Determine air content in accordance with ASTM C 138, ASTM C 173 or ASTM C 231.

F. Use of Concrete Classes: Use classes of concrete as indicated on Drawings and other Specifications. Use Class B for unreinforced concrete used for plugging pipes, seal slabs, thrust blocks, trench dams, tunnel inverts and concrete fill unless indicated otherwise. Use Class A for all other applications.

2.6 PVC WATERSTOPS

A. Extrude from virgin polyvinyl chloride elastomer. Use no reclaimed or scrap material. Submit waterstop manufacturer's current test reports and manufacturer's written certification that material furnished meets or exceeds Corps of Engineers Specification CRD-C572 and other specified requirements.

B. Flat Strip and Center-Bulb Waterstops:

1. Thickness: not less than 3/8 inch
2. Acceptable Manufacturers:
   a. Kirkhill Rubber Co., Brea, California
   b. Water Seals, Inc., Chicago, Illinois
   c. Progress Unlimited, Inc., New York, New York
   d. Greenstreak Plastic Products Co., St. Louis, Missouri
   e. Approved equal.

2.7 RESILIENT WATERSTOP

A. Resilient Waterstop: Where shown on Drawings; either bentonite- or adhesive-type material.

B. Bentonite Waterstop:

1. Material: 75 percent bentonite, mixed with butyl rubber-hydrocarbon containing less than 1.0 percent volatile matter, and free of asbestos fibers or asphaltics.
2. Manufacturer's rated temperature ranges: For application, 5 to 125 degrees F; in service, -40 to 212 degrees F.
3. Cross-sectional dimensions, unexpanded waterstop: 1 inch by 3/4 inch
4. Provide with adhesive backing capable of producing excellent adhesion to concrete surfaces.

C. Adhesive Waterstop:

1. Preformed plastic adhesive waterstop at least 2 inches in diameter.
2. Meets or exceeds requirements of Federal Specification SS-S-210A.
3. Supplied wrapped completely by 2 part protective paper.
4. Submit independent laboratory tests verifying that material seals joints in concrete against leakage when subjected to minimum of 30 psi water pressure for at least 72 hours.
5. Provide primer, to be used on hardened concrete surfaces, from same manufacturer who supplies waterstop material.
6. Acceptable Manufacturer: Synko-Flex Preformed Plastic Adhesive Waterstop, Synko- Flex Products, Inc.; or approved equal.

PART 3 EXECUTION

3.1 FORMS AND SHORING

A. Provide mortar-tight forms sufficient in strength to prevent bulging between supports. Set and maintain forms to lines designated such that finished dimensions of structures are within tolerances specified in ACI 117. Construct forms to permit removal without damage to concrete. Forms may be given slight draft to permit ease of removal. Provide adequate clean out openings. Before placing concrete, remove extraneous matter from within forms.

B. Install rigid shoring having no excessive settlement or deformation. Use sound timber in shoring centering. Shim to adjust and tighten shoring with hardwood timber wedges.

C. Design Loads for Horizontal Surfaces of Forms and Shoring: Minimum fluid pressure, 175 pounds per cubic foot; live load, 50 pounds per square foot. Maximum unit stresses: 125 percent of allowable stresses used for form materials and for design of support structures.

D. Back form work with sufficient number of studs and wales to prevent deflection.

E. Re-oil or lacquer liner on job before using. Facing may be constructed of 3/4 inch plywood made with waterproof adhesive backed by adequate studs and wales. In such cases, form lining will not be required.

F. Unless otherwise indicated, form outside corners and edges with triangular 3/4 inch chamfer strips (measured on sides).

G. Remove metal form ties to depth of at least 3/4 inch from surface of concrete. Do not burn off ties. Do not use pipe spreaders. Remove spreaders which are separate from forms as concrete is being placed.

H. Treat facing of forms with approved form coating before concrete is placed. When directed by Owner's Representative, treat both sides of face forms with coating. Apply coating before reinforcement is placed. Immediately before concrete is placed, wet surface of forms which will come in contact with concrete.

3.2 EMBEDDED ITEMS

A. Install conduit and piping as shown on Drawings. Accurately locate and securely fasten conduit, piping, and other embedded items in forms.

B. Install waterstops as specified in other sections and according to manufacturer's instructions. Securely position waterstops at joints as indicated on Drawings. Protect waterstops from damage or displacement during concrete placing operations.

3.3 BATCHING, MIXING AND DELIVERY OF CONCRETE

A. Measure, batch, mix, and deliver ready-mixed concrete in accordance with ASTM C 94, Sections 8 through 11. Produce ready-mixed concrete using automatic batching system as described in NRMCA Concrete Plant Standards, Part 2 - Plant Control Systems.

B. Measure, mix and deliver concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685, Sections 6 though 8.

C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of Owner's Representative before adjustment and change of mix proportions.

D. Ready-mixed concrete delivered to site shall be accompanied by batch tickets providing information required by ASTM C 94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing information required by ASTM C 685, Section 14.

E. When adverse weather conditions affect quality of concrete, postpone concrete placement. Do not mix concrete when air temperature is at or below 40 degrees F and falling. Concrete may be mixed with shade, away from artificial heat. Protect concrete from temperatures below 32 degrees F until concrete has cured for minimum of 3 days at 70 degrees F or 5 days at 50 degrees F.

F. Clean, maintain and operate equipment so that it thoroughly mixes material as required.

G. Hand-mix only when approved by Owner's Representative.

3.4 PLACING CONCRETE

A. Give sufficient advance notice to Owner's Representative (at least 24 hours prior to commencement of operations) to permit inspection of forms, reinforcing steel, embedded items and other preparations for placing concrete. Place no concrete prior to Owner's Representative's approval.

B. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, when necessary to continue after daylight hours, light site as required. When rainfall occurs after placing operations are started, provide covering to protect work.

C. Use troughs, pipes and chutes lined with approved metal or synthetic material in placing concrete so that concrete ingredients are not separated. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete. Allow no aluminum material to be in contact with concrete.

D. Limit free fall of concrete to 4 feet. Do not deposit large quantities of concrete at one location so that running or working concrete along forms is required. Do not jar forms after concrete has taken initial set; do not place strain on projecting reinforcement or anchor bolts.

E. Use tremies for placing concrete in walls and similar narrow or restricted locations. Use tremies made in sections, or provide in several lengths, so that outlet may be adjusted to proper height during placing operations.

F. Place concrete in continuous horizontal layers approximately 12 inches thick. Place each layer while layer below is still plastic.

G. Compact each layer of concrete with concrete spading implements and mechanical vibrators of approved type and adequate number for size of placement. When immersion vibrators cannot be used, use form vibrators. Apply vibrators to concrete immediately after depositing. Move vibrator vertically through layer of concrete just placed and several inches into plastic layer below. Do not penetrate or disturb layers previously placed which have partially set. Do not use vibrators to aid lateral flow concrete. Closely supervise consolidation to ensure uniform insertion and duration of immersion.

H. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R and ACI 309R.

3.5 WATERSTOPS

A. Embed waterstops in concrete across joints as shown. Waterstops shall be continuous for extent of joint; make splices necessary to provide continuity in accordance with manufacturer's instructions. Support and protect waterstops during construction operations; repair or replace waterstops damaged during construction.

B. Install waterstops in concrete on one side of joints, leaving other side exposed until next pour. When waterstop will remain exposed for 2 days or more, shade and protect exposed en temperature is 35 degrees waterstop from direct rays of sun during entire exposure and until exposed portion of waterstop is embedded in concrete.

3.6 F and rising. Take temperature readings in

A. Splicing PVC Waterstops:

1. Splice waterstops by heat-sealing adjacent waterstop sections in accordance with manufacturer's printed instructions.
2. Butt end-to-end joints of two identical waterstop sections may be made in forms during placement of waterstop material.
3. Prior to placement in form work, prefabricate waterstop joints involving more than two ends to be joined together, angle cut, alignment change, or joining of two dissimilar waterstop sections, allowing not less than 24 inch long strips of waterstop material beyond joint. Upon inspection and approval by Owner's Representative, install prefabricated waterstop joint assemblies in form work, and butt-weld ends of 24 inch strips to straight-run portions of waterstop in forms.

B. Setting PVC Waterstops:

1. Correctly position waterstops during installation. Support and anchor waterstops during progress of work to ensure proper embedment in concrete and to prevent folding over of waterstop by concrete placement. Locate symmetrical halves of waterstops equally between concrete pours at joints, with center axis coincident with joint openings. Thoroughly work concrete in joint vicinity for maximum density and imperviousness.
2. Where waterstop in a vertical wall joint does not connect with any other waterstop, and is not intended to be connected to waterstop in future concrete placement, terminate waterstop 6 inches below top of wall.

C. Replacement of Defective Field Joints: Replace waterstop field joints showing evidence of misalignment, offset, porosity, cracks, bubbles, inadequate bond or other defects with products and joints complying with Specifications.

D. Resilient Waterstop:

1. Install resilient waterstop in accordance with manufacturer's instructions and recommendations.
2. When requested by Owner's Representative, provide technical assistance by manufacturer's representative in field at no additional cost to City.
3. Use resilient waterstop only where complete confinement by concrete is provided; do not use in expansion or contraction joints.
4. Where resilient waterstop is used in combination with PVC waterstop, lap resilient waterstop over PVC waterstop minimum of 6 inches and place in contact with PVC waterstop. Where crossing PVC at right angles, melt PVC ribs to form smooth joining surface.
5. At free top of walls without connecting slabs, stop resilient waterstop and grooves (where used) 6 inches from top in vertical wall joints.
6. Bentonite Waterstop:
    a. Locate bentonite waterstop as near as possible to center of joint and extend continuous around entire joint. Minimum distance from edge of waterstop to face of member: 5 inches.
    b. Where thickness of concrete member to be placed on bentonite waterstop is less than 12 inches, place waterstop in grooves at least 3/4 inch deep and 1 1/4 inches wide formed or ground into concrete. Minimum distance from edge of waterstop placed in groove to face of member: 2.5 inches.
    c. Do not place bentonite waterstop when waterstop material temperature is below 40 degrees F. Waterstop material may be warmed so that it remains above 40 degrees F during placement but means used to warm it shall in no way harm material or its properties. Do not install waterstop where air temperature falls outside manufacturer's recommended range.
    d. Place bentonite waterstop only on smooth and uniform surfaces; grind concrete smooth when necessary to produce satisfactory substrate, or bond waterstop to irregular surfaces using epoxy grout which completely fills voids and irregularities beneath waterstop material. Prior to installation, wire brush concrete surface to remove laitance and other substances that may interfere with bonding of epoxy.

e. In addition to adhesive backing provided with waterstop, secure bentonite waterstop in place with concrete nails and washers at 12 inch maximum spacing.

7. Adhesive Waterstop:
   a. With wire brush thoroughly clean concrete surface on which waterstop is to be placed and then coat with primer.
   b. If surface is too rough to allow waterstop to form complete contact, grind to form adequately smooth surface.
   c. Install waterstop with top protective paper left in place. Overlap joints between strips minimum of 1 inch and cover back over with protective paper.
   d. Do not remove protective paper until just before final form work completion. Place concrete immediately. time that waterstop material is uncovered prior to concrete placement shall be minimized and shall not exceed 24 hours.

3.7 CONSTRUCTION JOINTS A.

Definitions:

1. Construction joint: Contact surface between plastic (fresh) concrete and concrete that has attained initial set.
2. Monolithic: Manner of concrete placement to reduce or eliminate construction joints; joints other than those indicated on Drawings will not be permitted without written approval of Owner's Representative. Where so approved, make additional construction joints with details equivalent to those indicated for joints in similar locations.
3. Preparation for Construction Joints: Roughen surface of concrete previously placed, leaving some aggregate particles exposed. Remove laitance and loose materials by sandblasting or high-pressure water blasting. Keep surface wet for several hours prior to placing of plastic concrete.

3.8 CURING

A. Comply with ACI 308. Cure by preventing loss of moisture, rapid temperature change and mechanical injury for period of 7 curing days when Type II or IP cement has been used and for 3 curing days when Type III cement has been used. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. A curing day is any calendar day in which temperature is above 50 degrees F for at least 19 hours. Colder days may be counted when air temperature adjacent to concrete is maintained above 50 degrees
F. In continued cold weather, when artificial heat is not provided, removal of forms and shoring may be permitted at end of calendar days equal to twice required number of curing days. However, leave soffit forms and shores in place until concrete has reached specified 28 day strength, unless directed otherwise by Owner's Representative.

B. Cure formed surfaces not requiring rubbed-finished surface by leaving forms in place for full curing period. Keep wood forms wet during curing period. Add water as needed for other types of forms. Or, at Contractor's option, forms may be removed after 2 days and curing compound applied.

C. Rubbed Finish:

1. At formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging surface.
2. After rubbed-finish operations are complete, continue curing formed surfaces by using either approved curing/sealing compounds or moist cotton mats until normal curing period is complete.

D. Unformed Surfaces: Cure by membrane curing compound method.

1. After concrete has received final finish and surplus water sheen has disappeared, immediately seal surface with uniform coating of approved curing compound, applied at

rate of coverage recommended by manufacturer or as directed by Owner's Representative. Do not apply less than 1 gallon per 180 square feet of area. Provide satisfactory means to properly control and check rate of application of compound.

2. Thoroughly agitate compound during use and apply by means of approved mechanical power pressure sprayers equipped with atomizing nozzles. For application on small miscellaneous items, hand-powered spray equipment may be used. Prevent loss of compound between nozzle and concrete surface during spraying operations.
3. Do not apply compound to dry surface. When concrete surface has become dry, thoroughly moisten surface immediately prior to application. At locations where coating shows discontinuities, pinholes or other defects, or when rain falls on newly coated surface before film has dried sufficiently to resist damage, apply additional coat of compound at specified rate of coverage.

3.9 REMOVAL OF FORMS AND SHORING

A. Remove forms from surfaces requiring rubbing only as rapidly as rubbing operation progresses. Remove forms from vertical surfaces not requiring rubbed-finish when concrete has aged for required number of curing days. When curing compound is used, do not remove forms before 2 days after concrete placement.

B. Leave soffit forms and shores in place until concrete has reached specified 28-day strength, unless directed otherwise by Owner's Representative.

3.10 DEFECTIVE WORK

A. Immediately repair defective work discovered after forms have been removed. When concrete surface is bulged, uneven, or shows excess honeycombing or form marks which cannot be repaired satisfactorily through patching, remove and replace entire section.

3.11 FINISHING

A. Patch honeycomb, minor defects and form tie holes in concrete surfaces with cement mortar mixed one part cement to two parts fine aggregate. Repair defects by cutting out unsatisfactory material and replacing with new concrete, securely keyed and bonded to existing concrete. Finish to make junctures between patches and existing concrete as inconspicuous as possible. Use stiff mixture and thoroughly tamp into place. After each patch has stiffened sufficiently to allow for greatest portion of shrinkage, strike off mortar flush with surface.

B. Apply rubbed finish to exposed surfaces of formed concrete structures as noted on Drawings. After pointing has set sufficiently, wet surface with brush and perform first surface rubbing with No. 16 carborundum stone, or approved equal. Rub sufficiently to bring surface to paste, to remove form marks and projections, and to produce smooth, dense surface. Add cement to form surface paste as necessary. Spread or brush material, which has been ground to paste, uniformly over surface and allow to reset. In preparation for final acceptance, clean surfaces and perform final finish rubbing with No. 30 carborundum stone or approved equal. After rubbing, allow paste on surface to reset; then wash surface with clean water. Leave structure with clean, neat and uniform-appearing finish.

C. Apply wood float finish to concrete slabs.

3.12 FIELD QUALITY CONTROL

A. Testing shall be performed under provisions of Division 1.

B. Unless otherwise directed by Owner's Representative, following minimum testing of concrete is required. Testing shall be performed by qualified individuals employed by approved independent testing agency, and conform to requirements of ASTM C 1077.

1. Take concrete samples in accordance with ASTM C 172.

2. Make one set of four compression test specimens for each mix design at least once per day and for each 150 cubic yards or fraction thereof. Make, cure and test specimens in accordance with ASTM C 31 and ASTM C 39.
3. When taking compression test specimens, test each sample for slump according to ASTM C 143, for temperature according to ASTM C 1064, for air content according to ASTM C 231, and for unit weight according to ASTM C 138.
4. Inspect, sample and test concrete in accordance with ASTM C 94, Section 13, 14, and 15, and ACI 311-5R.

C. Test Cores: Conform to ASTM C 42.

D. Testing High Early Strength Concrete: When Type III cement is used in concrete, specified 7 day and 28 day compressive strengths shall be applicable at 3 and 7 days, respectively.

E. If 7-day or 3-day test strengths (as applicable for type of cement being used) fail to meet established strength requirements, extended curing or resumed curing on those portions of structure represented by test specimens may be required. When additional curing fails to produce required strength, strengthening or replacement of portions of structure which fail to develop required strength may be required by Owner's Representative, at no additional cost to City.

3.13 PROTECTION

A. Protect concrete against damage until final acceptance by City and/or County.

B. Protect fresh concrete from damage due to rain, hail, sleet, or snow. Provide protection while concrete is still plastic, and whenever precipitation is imminent or occurring.

C. Do not backfill around concrete structures or subject them to design loadings until components of structure needed to resist loading are complete and have reached specified 28 day compressive strength, except as authorized otherwise by Owner's Representative.

END OF SECTION 33 05 16.16

SECTION 33 06 10.14

POLYVINYL CHLORIDE (PVC) PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Polyvinyl chloride pressure pipe for water distribution, in nominal diameters 4 inches through 20 inches.

B. Polyvinyl chloride sewer pipe for gravity sewers in nominal diameters 4 inches through 48 inches.

C. Polyvinyl chloride pressure pipe for gravity sewers and force mains in nominal diameters 4 inches through 20 inches.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ANSI A 21.16 (AWWA C 116) - Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey Iron Fittings for Water Supply Service.

B. ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

C. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

D. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

E. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

F. ASTM D 2444 - Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).

G. ASTM D 2680 - Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

H. ASTM D 3034 - Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

I. ASTM D 3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

J. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

K. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

L. ASTM F 679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

M. ASTM F 794 - Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and

Fittings Based on Controlled Inside Diameter.

N. ASTM F 949 - Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.

O. AWWA C 110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches Through 48 Inches for Water.

P. AWWA C 111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

Q. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches for Water Distribution.

R. AWWA C 905 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., for Water Transmission and Distribution.

S. AWWA C 909 - Standard for Molecularly-Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 Inches through 12 Inches (100mm through 300 mm), for Water Distribution.

T. PPI TR3 - Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.

U. UNI-B-13 - Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride Pipe.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.

1.5 QUALITY CONTROL

A. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of this Section and AWWA C 900, AWWA C 909 and AWWA C 905 for pressure pipe applications, or appropriate ASTM standard specified for gravity sewer pipe.

B. Submit manufacturer's certification that PVC pressure pipe for water lines and force mains has been hydrostatically tested at factory in accordance with AWWA C 900, AWWA C 909 and AWWA C 905, and this Section.

C. When foreign manufactured material is proposed for use, have material tested for conformance to applicable ASTM requirements by certified independent testing laboratory located in United States. Certification from other source is not acceptable. Furnish copies of test reports to Owner's Representative for review. Cost of testing paid by Contractor.

PART 2 PRODUCTS

2.1 MATERIAL

A. Use PVC compounds in manufacture of pipe that contain no ingredient in amount that has been demonstrated to migrate into water in quantities considered to be toxic.

B. Furnish PVC pressure pipe manufactured from Class 12454-A or Class 12454-B virgin PVC compounds as defined in ASTM D 1784. Use compounds qualifying for rating of 4000 psi for water at 73.4 F per requirements of PPI TR3. Provide pipe which is homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties. Deliver pipe with surfaces free from nicks and scratches with joining surfaces of spigots and joints free from gouges and imperfections which could cause leakage.

C. PVC Restrained Pipe: Must be listed on City's current Product Approval List.

1. Pipe Material:
   a. DR 18: For restrained joints where shown on Drawings.
   b. DR 14: For alternate to offset pipe sections shown on Drawings. Do not use PVC for offset sections with depth of cover greater than 20 feet or less than 4 feet. Do not use PVC in potentially petroleum contaminated areas.

D. Water Service.

1. Provide self-extinguishing PVC pipe that bears Underwriters' Laboratories mark of approval and is acceptable without penalty to Texas State Fire Insurance Committee for use in fire protection lines.
2. Bear National Sanitation Foundation Seal of Approval (NSF-PW).

E. Gaskets:

1. Gaskets shall meet requirements of ASTM F 477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.
2. Flat Face Mating Flange: Full faces 1/8-inch-thick ethylene propylene (EPR) rubber.
3. Raised Face Mating Flange: Flat ring 1/8-inch ethylene propylene (EDR) rubber, with filler gasket between OD of raised face and flange OD to protect flange from bolting moment.

F. Lubricant for rubber-gasketed joints: Water soluble, non-toxic, non-objectionable in taste and odor imparted to fluid, non-supporting of bacteria growth, having no deteriorating effect on PVC or rubber gaskets.

G. Do not use PVC in potentially or known contaminated areas.

H. Do not use PVC in areas exposed to direct sunlight.

2.2 WATER SERVICE PIPE

A. Pipe 4 inch through 12 inch: AWWA C 900, AWWA C 909, Class 150, DR 18; AWWA C 900, Class 200, DR 14 as alternate to offset pipe sections; nominal 20-foot lengths; cast-iron equivalent outside diameters.

B. Pipe 14 inch through 20 inch: AWWA C 905; Class 235; DR 18; nominal 20-foot lengths; cast-iron equivalent outside diameter.

C. Provide Polyvinyl Chloride Pipe from approved manufacturers.

D. Make curves and bends by deflecting joints. Do not exceed maximum deflection recommended by pipe manufacturer. Submit details of other methods of providing curves and bends for review by Owner's Representative.

E. Hydrostatic Test: AWWA C 900, AWWA C 905, AWWA C 909, ANSI A 21.10 (AWWA C 110); at point of manufacture; submit manufacturer's written certification.

2.3 GRAVITY SEWER PIPE

A. PVC gravity sanitary sewer pipe and storm sewer pipe shall be in accordance with provisions in following table:

Wall Construction	Manufacturer	ASTM Designation	SDR (Max.)/ Stiffness (Min.)	Diameter Size Range
Solid	J-M Pipe	D3034	SDR 26 / PS 115	6” to 10”
	Certain Teed	D3034	SDR 35 / PS 46	12” & 15”
	Diamond	F679	SDR 35 / PS 46	18” to 27”
	Uponor ETI	AWWA C900	DR 18 / N/A	4” to 12”
	North American	AWWA C909	DR 18 / N/A	4” to 12”
		AWWAC905	DR 18 / N/A	14” to 16”
Truss (Gasketed)	Contech	D2680	N/A / 200 psi	8” to 15”
Profile	Contech A-2000	F949	N/A / 46 psi	12” to 36”
	Contech A-2026	F949	N/A / 115 psi	8” to 10”
	ETI, Ultra-Rib	F794	N/A / 46 psi	8” to 30”
	ETI, Ultra-Corr	F794	N/A / 46 psi	24” to 36”

B. When solid wall PVC pipe 18 inches to 27 inches in diameter is required in SDR 26, provide pipe conforming to ASTM F 679, except provide wall thickness as required for SDR 26 and pipe strength of 115 psi.

C. For sewers up to 12-inch diameter crossing over water lines, or crossing under water lines with less than 2-feet separation, provide minimum 150 psi pressure-rated pipe conforming to ASTM D 2241 with suitable PVC adapter couplings.

D. Joints: Spigot and integral wall section bell with solid cross section elastomeric or rubber ring gasket conforming to requirements of ASTM D 3212 and ASTM F 477, or ASTM D 3139 and ASTM F 477. Gaskets shall be factory-assembled and securely bonded in place to prevent displacement. Manufacturer shall test sample from each batch conforming to requirements ASTM D 2444.

E. Fittings: Provide PVC gravity sewer sanitary bends, tee, or wye fittings for new sanitary sewer construction. PVC pipe fittings shall be full-bodied, either injection molded or factory fabricated. Saddle-type tee or wye fittings are not acceptable.

F. Conditioning. Conditioning of samples prior to and during tests is subject to approval by Owner's Representative. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D 618 at 73.4 degrees F plus or minus 3.6 degrees F and 50 percent relative humidity plus or minus 5 percent relative humidity for not less than 40 hours prior to test. Conduct tests under same conditions of temperature and humidity unless otherwise specified.

G. Pipe Stiffness. Determine pipe stiffness at 5 percent deflection in accordance with Test Method D 2412. Minimum pipe stiffness shall be 46 psi. For diameters 4 inches through 18 inches, test three specimens, each a minimum of 6 inches (152 mm) in length. For diameters 21 inch through 36 inch, test three specimens, each a minimum of 12 inch (305 mm) in length. Flattening. Flatten three specimens of pipe, prepared in accordance with Paragraph 2.04F, in suitable press until internal diameter has been reduced to 60 percent of original inside diameter of pipe. Rate of loading shall be uniform. Test specimens, when examined under normal light and with unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of pipe walls or bracing profiles. Perform the

flattening test in conjunction with pipe stiffness test.

H. Joint Tightness. Test for joint tightness in accordance with ASTM D 3212, except that joint shall remain watertight at minimum deflection of 5 percent. Manufacturer will be required to provide independent third party certification for joint testing each diameter of storm sewer pipe.

I. Purpose of Tests. Flattening and pipe stiffness tests are intended to be routine quality control tests. Joint tightness test is intended to qualify pipe to specified level of performance.

2.4 SANITARY SEWER FORCE MAIN PIPE

A. Provide approved PVC pressure pipe conforming to requirements for water service pipe, and conforming to minimum working pressure rating specified in Division 33.

B. Acceptable pipe joints are integral bell-and-spigot, containing a bonded-in elastomeric sealing ring meeting requirements of ASTM F 477. In designated areas requiring restrained joint pipe and fittings, use approved joint restraint device conforming to UNI-B-13, for PVC pipe 12-inch diameter and less.

C. Fittings: Provide approved ductile iron fittings as per Division 33, except furnish fittings with one of following approved internal linings:

1. Nominal 40 mils (35 mils minimum) virgin polyethylene complying with ASTM D 1248, heat fused to interior surface of fitting
2. Nominal 40 mils (35 mils minimum) polyurethane
3. Nominal 40 mils (35 mils minimum) ceramic epoxy
4. Nominal 40 mils (35 mils minimum) fusion bonded epoxy

D. Exterior Protection: Provide polyethylene wrapping of ductile-iron fittings as required by Division 33.

E. Hydrostatic Tests: Hydrostatically test pressure rated pipe in accordance with Paragraph 2.02E.

2.5 BENDS AND FITTINGS FOR PVC PRESSURE PIPE

A. Bends and Fittings: ANSI A 21.10 or ANSI A 21.53, ductile iron; ANSI A 21.11 single rubber gasket push-on type joint; minimum 150 psi pressure rating. Approved restrained joints, 250 200 psi, may be provided for up to 12 inches in diameter (water or sanitary).

B. Provide approved restrained joint fittings: Integral restrained joint fittings and pipe do not require secondary restraint.

PART 3 EXECUTION

3.1 PROTECTION

A. Store pipe under cover out of direct sunlight and protect from excessive heat or harmful chemicals in accordance with manufacturer's recommendations.

3.2 INSTALLATION

A. Conform to requirements of Division 33, as applicable.

B. Install PVC pipe in accordance with Division 33, ASTM D 2321 for Sewer Pipe, and manufacturer's recommendations.

C. Install PVC water service pipe to clear utility lines and have minimum depth of cover below property line grade of street, unless otherwise required by Drawings:

1. Water service pipe 12 inches in diameter and smaller 4 feet of cover.
2. Water service pipe 16 inches in diameter and larger 5 feet of cover.

D. Avoid imposing strains that will overstress or buckle pipe when lowering pipe into trench.

E. Hand shovel pipe bedding under pipe haunches and along sides of pipe barrel and compact to eliminate voids and ensure side support.

F. Store PVC pipe under cover out of direct sunlight. Protect pipe from excessive heat or harmful chemicals. Prevent damage by crushing or piercing.

G. Allow PVC pipe to cool to ground temperature before backfilling when assembled out of trench to prevent pullout due to thermal contraction.

3.3 PVC RESTRAINED MECHANISM

A. Do not apply lubricant to spline or pipe or coupling spline grooves.

B. Do not use excessive force while inserting the spline through coupling.

C. Insert spline until it is fully seated around circumference of pipe.

D. Field Cutting of Pipe Ends:
1. Perform by workers certified by manufacturer.
2. Use a PVC pipe cutter and provide square ends.
3. Use manufacturer approved power routing and grooving tool to field fabricate required pipe groove.

END OF SECTION 33 06 10.14

SECTION 33 06 10.15

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ductile iron pipe and fittings for water mains, wastewater force mains, gravity sanitary sewers, and storm sewers.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 REFERENCES

A. ANSI A 21.4 (AWWA C 104) - Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings, for Water and Other Liquids.

B. ANSI A 21.10 (AWWA C 110) - Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in., for Water and Other Liquids.

C. ANSI A 21.11 (AWWA C 111) - Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

D. ANSI A 21.15 (AWWA C 115) - Flanged Ductile-Iron Pipe with Threaded Flanges.

E. ANSI A 21.50 (AWWA C 150) - Thickness Design of Ductile-Iron Pipe.

F. ANSI A 21.51 (AWWA C 151) - Ductile-Iron Pipe, Centrifugally Cast for Water and Other Liquids.

G. ANSI A 21.53 (AWWA C 153) - Ductile Iron Compact Fittings, 3 inches through 24 inches and 54 inches through 64 inches for water service.

H. ANSI B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

I. ASTM D 1248 - Polyethylene Plastics Molding and Extrusion Materials.

J. ASTM G 62 - Test Methods for Holiday Detection in Pipeline Coatings.

K. AWWA C 600 - Standard for Installation of Ductile Iron Water Mains and Their Appurtenances.

L. SSPC-SP 6 - Steel Structures Painting Council, Commercial Blast Cleaning.

1.4 SUBMITTALS

A. Conform to requirements of Section - Submittal Procedures.

B. Submit shop drawings showing design of pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fitting, flange, and special details. Show station numbers for pipe and fittings corresponding to Drawings. Production of pipe and fittings prior to review by Engineer is at Contractor's risk.

1.5 QUALITY CONTROL

A. Provide manufacturer's certifications that all ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at factory and meet requirements of ANSI

A 21.51.

B. Provide certifications that all pipe joints have been tested and meet requirements of ANSI A 21.11.

PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE

A. Ductile Iron Pipe Barrels: ANSI A 21.15, ANSI A 21.50 or ANSI A 21.51; bear mark of Underwriters' Laboratories approval; minimum thickness Class 51 for water mains and Class 52 for sanitary sewers, or as shown on Drawings. Provide minimum thickness Class 53 for flanged pipe.

B. Provide pipe sections in standard lengths, not less than 18 feet long, except for special fittings and closure sections as indicated on shop drawings.

2.2 JOINTS

A. Joint Types: ANSI A 21.11 push-on; ANSI A 21.11 mechanical joint; or ANSI A 21.15 flanged end. Provide push-on joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, bolts shall conform to requirements of AWWA C 111.

B. Where restrained joints for buried service are required by Drawings, provide one of the following, or equal:

1. Super-Lock Joint by Clow Corporation.
2. Flex-Ring or Lok-Ring by American Cast Iron Pipe Company.
3. TR-Flex Joint by U.S. Pipe and Foundry Company.

C. Threaded- or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.

D. Provide for restrained joints designed to meet test pressures required under Section 33 13 00.10 - Hydrostatic Testing of Pipelines as applicable.

E. Where ductile iron water main is cathodically protected from corrosion, bond rubber gasketed joints as shown on Drawings to provide electrical continuity along entire pipeline, except where insulating flanges are required by Drawings.

2.3 GASKETS

A. Furnish, when no contaminant is identified, plain rubber (SBR) gasket material; for flanged joints 1/8-inch-thick gasket in accordance with ANSI A 21.15.

B. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed pipeline, shall have the following gasket materials for the noted contaminants:

Contaminant	Gasket Material Required
Petroleum (diesel, gasoline)	Nitrile Rubber
Other contaminants	As recommended by the pipe manufacture

2.4 FITTINGS

A. Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings. Line and coat fittings as specified for pipe they serve.

B. Push-on Fittings: ANSI A 21.10; ductile iron ANSI A 21.11 joints, gaskets, and lubricants; pressure rated at 250 psig.

C. Flanged Fittings: ANSI A 21.10; ANSI B 16.1 cast or ductile iron. Flanges: ANSI B 16.1, Class 125; pressure rated at 250 psig.

D. Mechanical Joint Fittings: ANSI A 21.11 (AWWA C 110); pressure rated at 250 psi.

E. Ductile Iron Compact Fittings for Water Mains: ANSI A 21.53; 4-inch through 12-inch diameter; cement-mortar lining; conform to requirements Division 33 - Polyethylene Wrap.

2.5 COATINGS AND LININGS

A. Water Main Interiors: ANSI A21.4, cement lined with seal coat.

B. Sanitary Sewer and Force Main Interiors:
1. Preparation: Commercial blast cleaning conforming to SSPC-SP6.
2. Liner thickness: Nominal 40 mils, minimum 35 mils, for pipe barrel interior; minimum 6 to 10 mils at gasket groove and outside spigot end to 6-inches back from end.
3. Testing: ASTM G 62, Method B for voids and holidays; provide written certification.
4. Acceptable Lining Materials:

a. Virgin polyethylene conforming to ASTM D 1248, with inert fillers and carbon black to resist ultraviolet degradation during storage heat bonded to interior surface of pipe and fittings; APolyline@ by American Cast Iron Pipe Company; or equal.
b. Polyurethane: Corro-pipe II by Madison Chemicals.
c. Ceramic Epoxy: Protecto-401 by Enduron Protective Coatings.

C. Sanitary Sewer Point Repair Pipe: For pipes which will be lined with high density polyethylene liner pipe or cured-in-place liner, provide cement-lined with seal coat in accordance with ANSI A 21.4. For pipes which will not be provided with named liner, provide pipe as specified in Paragraph 2.05B, Sanitary Sewer and Force Main Interiors.

D. Exterior: Prime coat and outside asphaltic coating conforming to ANSI A 21.10, ANSI A 21.15, or ANSI A 21.51 for pipe and fittings in open cut excavation and in casings.

E. Polyethylene Wrap: For buried water lines and sanitary sewers, including point repairs, provide polyethylene wrap unless otherwise specified or shown. Provide polyethylene wrap for buried ductile iron pipe, including polyurethane coated pipe. Conform to requirements of Division 33 - Polyethylene Wrap.

F. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or equal, for the complete joint and alloy steel fasteners. Alternatively, provide bolts made of Type 304 stainless steel.

G. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer as resistant to the contaminants identified in the Phase II Environmental Site Assessment Report.

2.6 MANUFACTURERS

A. Pre-approved manufacturers of ductile iron pipe are American Cast Iron Pipe Co., McWayne Cast Iron Pipe Co., and U. S. Pipe and Foundry Co.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conform to installation requirements of Sections 33 11 00 - Water Utility Distribution Piping, and 33 31 00 - Sanitary Utility Sewerage Piping, except as modified in this Section.

B. Install in accordance with AWWA C 600 and manufacturer's recommendations.

C. Install all ductile iron pipe in polyethylene wrap, unless cathodic protection is provided. Do not use polyethylene wrap with a cathodic protection system.

3.2 GRADE

A. Unless otherwise specified on Drawings, install ductile iron pipe for water service to clear utility lines with following minimum cover:

Diameter (Inches)	Depth of Cover (Feet)
16 and 24	12 and smaller

END OF SECTION 33 06 10.15

SECTION 33 06 40.10

HDPE SOLID AND PROFILE WALL PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High density polyethylene (HDPE) pipe for gravity sewers and drains, including fittings.

B. High density polyethylene (HDPE) pipe for sanitary sewer force mains, including fittings.

C. High density polyethylene (HDPE) pipe for storm sewers culverts.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. AASHTO M 294 - Standard Specification for Corrugated Polyethylene Drainage Pipe, 18"- 48" diameter.

B. AASHTO Section 18 - Soil Thermoplastic Pipe Interaction Systems.

C. AASHTO Section 30 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity Flow Applications.

D. ASTM D 618 - Standard Practice for Conditioning Plastics for Testing.

E. ASTM D 1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

F. ASTM D 2321 - Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Pipe.

G. ASTM D 2657 - Standard Practice for Heat Fusion Joining Polyolefin Pipe and Fittings.

H. ASTM D 2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

I. ASTM D 3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

J. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

K. ASTM D 3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

L. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

M. ASTM F 714 - Standard Specification for Polyethylene Plastic (PE) Pipe (SDR-PR) Based on Outside Diameter.

N. ASTM F 894 - Standard Specification for Polyethylene (PE) Large-Diameter Profile Wall Sewer and

Drain Pipe.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit shop drawings showing design of pipe and fittings, laying dimensions, fabrication, fittings, flanges, and special details.

1.5 QUALITY CONTROL

A. Provide manufacturer's certificate of conformance to Specifications.

B. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. Provide pipe as uniform as commercially practical in color, opacity, density, and other physical properties.

C. Owner's Representative reserves right to inspect pipes or witness pipe manufacturing. Inspection shall in no way relieve manufacturer of responsibilities to provide products that comply with applicable standards and these Specifications.

1. Manufacturer's Notification: Should Owner's Representative wish to witness manufacture of specific pipes, manufacturer shall provide Owner's Representative with minimum three weeks notice of when and where production of those specific pipes will take place.
2. Failure to Inspect. Approval of products or tests is not implied by Owner's Representative's decision not to inspect manufacturing, testing, or finished pipes.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with documented experience of minimum 5 years of pipe installations that have been in successful, continuous service for same type of service as proposed Work.

PART 2 PRODUCTS

2.1 **GENERAL**

A. For sanitary sewer pipe provide HDPE pipe as follows:

1. New construction pipe products gravity sanitary sewer direct bury.

INSTALLATION SPEC NO.	GENERIC NAME	TRADE NAME OR MANUFACTURER	ASTM or AASHTO	SDR (NUMERIC MAXIMUM)	PIPE STIFFNESS (NUMERIC MINIMUM)	SIZE RANGE
02505	Solid Wall Polyethylene (HDPE)	Chevron Plexco Phillip 66 Quail Poly Pipe	ASTM F-714	DR 17 DR 21	115 46	8” - 10” 12” - 48”
02531	Polyethylene Profile Wall	Spirolite	ASTM F-894	n/a	46	8 J CM

2. REHABILITATION CONSTRUCTION PIPE PRODUCTS SLIPLINING OF SANITARY SEWER

INSTALLATION SPEC NO.	GENERIC NAME	TRADE NAME OR MANUFACTURER	ASTM	SDR (NUMERIC MAXIMUM)	PIPE STIFFNESS (NUMERIC	SIZE RANGE
02550	Solid Wall Poly	Chevron Plexco Quail Poly Pipe AmeriFlow by NAPCO Ameriflow by KWH	F-714	DR 21	46	8” - 48” 3" - 12” 14” - 63”
02550	Polyethylene Profile Wall	Spirolite	F-894	n/a	46	18”-120”

B. For Storm Sewer and Residential Driveway Culverts provide HDPE as follows:

1. N-12 and N-12 HC by Advanced Drainage Systems, Inc. (ADS).
2. Sure-Lok F477 by Hancor, Inc.

C. Furnish solid wall pipe with plain end construction for heat joining (butt fusion) conforming to ASTM D 2657. Utilize controlled temperatures and pressures for joining to produce fused leak-free joint.

D. Furnish profile-wall gravity sewer pipe with bell-and-spigot end construction conforming to ASTM D 3212. Joining will be accomplished with elastomeric gasket in accordance with manufacturer's recommendations. Use integral bell-and-spigot gasketed joint designed so that when assembled, elastomeric gasket, contained in machined groove on pipe spigot, is compressed radially in pipe bell to form positive seal. Design joint to avoid displacement of gasket when installed in accordance with manufacturer's recommendations.

E. Furnish solid wall pipe for sanitary sewer force mains with minimum working pressure rating of 150 psi, and with inside diameter equal to or greater than nominal pipe size indicated on Drawings.

F. Furnish corrugated polyethylene pipe (CPP) for gravity storm sewer pipe. Joints shall be installed such that connection of pipe sections will form continuous line free from irregularities in flow line. Suitable joints are:

1. Integral Bell and Spigot. Bell shall overlap minimum of two corrugations of spigot end when fully engaged conforming to the requirements of ASTM F-477.

G. Jointing:

1. Gaskets:
   a. Meet requirements of ASTM F 477. Use gasket molded into circular form or extruded to proper section and then spliced into circular form. When no contaminant is identified, use gaskets of properly cured, high-grade elastomeric compound. Basic polymer shall be natural rubber, synthetic elastomer, or blend of both.
   b. Pipes allowed to be installed in potentially contaminated areas,

where free product is found near elevation of proposed sewer, shall have the following gasket materials for noted contaminants:

Contaminant	Gasket Material Required
Petroleum (diesel, gasoline)	Nitrile Rubber
Other contaminants	As recommended by pipe manufacturer

2. Lubricant. Use lubricant for assembly of gasketed joints which has no detrimental effect on gasket or on pipe, in accordance with manufacturer's recommendations.

2.2 MATERIALS FOR SANITARY SEWER

A. Pipe and Fittings: High density, high molecular weight polyethylene pipe material meeting requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D 1248. Material meeting requirements of cell classification in accordance with ASTM D 3350 are also suitable for making pipe products under these specifications.

B. Other Pipe Materials: Materials other than those specified in Paragraph 2.02A, Pipe and Fittings, may be used as part of profile construction, e.g., as core tube to support shape of profile during processing, provided that these materials are compatible with base polyethylene material and are completely encapsulated in finished product and in no way compromise performance of pipe products in intended use. Examples of suitable material include polyethylene and polypropylene.

2.3 MATERIALS FOR STORM SEWERS AND RESIDENTIAL DRIVEWAY CULVERTS

A. Pipe and Fittings: High density, high molecular weight polyethylene HDPE virgin compound material meeting requirements of cell class outlined in AASHTO M 294, AASHTO MP7 and ASTM D 3350.

B. Types: CPP shall meet one or both of following:

1. Type S: Outer corrugated wall with smooth inner liner.
2. Type D: Inner and outer smooth walls braced circumferentially or spirally with projections or ribs.

C. Lubricant: Use lubricant for assembly of gasketed joints, which has no detrimental effect on gasket or on pipe, in accordance with manufacturer's recommendations.

2.4 TEST METHODS FOR SANITARY SEWER

A. Conditioning. Conditioning of samples prior to and during tests is subject to approval by Owner's Representative. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D 618 at 73.4 degrees F plus or minus 3.6 degrees F and 50 percent relative humidity plus or minus 5 percent relative humidity for not less than 40 hours prior to test. Conduct tests under same conditions of temperature and humidity unless otherwise specified.

B. Flattening. Flatten three specimens of pipe, prepared in accordance with Paragraph 2.05A, in suitable press until internal diameter has been reduced to 40 percent of original inside diameter of pipe. Rate of loading shall be uniform and at 2 inches per minute. Test specimens, when examined under normal light and with unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of pipe walls or bracing profiles.

C. Joint Tightness. Test for joint tightness in accordance with ASTM D 3212, except replace shear load transfer bars and supports with 6-inch-wide support blocks that can be either flat or contoured to conform to pipe's outer contour.

D. Purpose of Tests. Flattening and joint tightness tests are not intended to be routine quality control tests, but rather to qualify pipe to a specified level of performance.

2.5 TEST METHODS FOR STOMR SEWERS AND RESDENTIAL DRIVEWAY CULVERTS

A. Pipe stiffness at 5 percent deflection, when determined in accordance with ASTM D 2412, shall be as specified in Section 7.4 of AASHTO M 294.
following information:

1. Pipe size.
2. Pipe class.
3. Production code.
4. Material designation.

B. Minimum inner wall thickness shall be as specified in Section 7.2.2 of AASHTO M 294.

2.6 MARKING

A. Mark each standard and random length of pipe in compliance with these Specifications with

PART 3 EXECUTION

3.1 INSTALLATION

A. Conform to requirements of Division 33.

B. Install pipe in accordance with the manufacturers recommended installation procedures.

C. HDPE pipe is not approved in applications requiring augering of pipe.

D. Bedding and backfill: Conform to requirements of Division 31.

END OF SECTION 33 06 40.10

SECTION 33 06 40.11

REINFORCED CONCRETE PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforced concrete pipe for storm sewers.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 REFERENCES

A. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

B. ASTM C 443 - Joints for Circular Concrete Sewer and Culvert Pipe.

C. ASTM C 497 - Method of Testing Concrete Pipe, Sections, or Tile.

D. ASTM C 506 - Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.

E. ASTM C 507 - Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.

F. ASTM C 655 - Reinforced Concrete D-load Culvert, Storm Drain and Sewer Pipe.

G. ASTM C 822 - Standard Definitions and Terms Relating to Concrete Pipe and Related Products.

H. ASTM C 877 - Standard Specification for External Sealing Bands for Non circular Concrete Sewer, Storm Drain, and Culvert Pipe.

1.4 SUBMITTALS

A. Submittals shall conform to requirements in Division 1.

B. Submit complete product data for pipe, fittings and gaskets for approval. Indicate conformance to appropriate reference standards.

C. Submit certificates by a testing laboratory, hired and paid by the manufacturer, that concrete pipes meet applicable standards when tested in accordance with ASTM C 497.

PART 2 PRODUCTS

2.1 REINFORCED CONCRETE PIPE

A. Circular reinforced concrete pipe shall conform to requirements of ASTM C 76, for Class III wall thickness. Joints shall be rubber gasketed conforming to ASTM C 443.

B. Reinforced concrete arch pipe shall conform to the requirements of ASTM C 506 for Class A- III. Joints shall conform to ASTM C 877.

C. Reinforced concrete elliptical pipe, either vertical or horizontal, shall conform to the requirements of ASTM C 507 for Class VE-III for vertical or Class HE-III for horizontal. Joints shall be rubber gaskets conforming to ASTM C 877.

D. Reinforced concrete D-load pipe shall conform to the requirements of ASTM C 655.

2.2 GASKETS

A. When no contaminant is identified, furnish rubber gasket conforming to ASTM C 443 for circular reinforced concrete pipe and rubber gasket conforming to ASTM C 877 for reinforced concrete elliptical pipe.

B. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed sewer, shall have the following gasket materials for the noted contaminants:

CONTAMINANT	GASKET MATERIAL REQUIRED
Petroleum (diesel, gasoline)	Nitrile Rubber
Other Contaminants	As recommended by the pipe manufacturer

2.3 SOURCE QUALITY CONTROL

A. Representatives of Engineer will inspect manufacturer's plant and casting operations as deemed necessary.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conform to requirements of the following Sections, as applicable:

1. 33 41 00 - Storm Utility Drainage Piping

B. Install reinforced concrete pipe in accordance with manufacturer's recommendations.

END OF SECTION 33 06 40.11

SECTION 33 11 00

WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Installation of water lines.

B. Specifications identify requirements for both small diameter water lines and large diameter water lines. When specifications for large diameter water lines differ from those for small diameter water lines, large diameter specifications will govern for large diameter pipe.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ANSI A 21.11/AWWA C111 - Standard for Rubber-Gasket Joints for Ductile - Iron Pressure Pipe and Fittings

B. ANSI/NSF Standard 61 - Drinking Water System -Health Components

C. ASTM A 36 - Standard Specification for Carbon Structural Steel

D. ASTM A 536 - Standard Specification for Ductile Iron Castings

E. ASTM A 126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

F. ASTM B 21 - Standard Specification for Naval Brass Rod, Bar, and Shapes

G. ASTM B 98 - Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes

H. ASTM B 301 - Standard Specification for Free-Cutting Copper Rod and Bar

I. ASTM B 584 - Standard Specification for Copper Alloy Sand Casting for General Application.

J. ASTM E 165 - Standard Test Method for Liquid Penetrant Examination

K. ASTM E 709 - Standard Guide for Magnetic Particle Examination

L. ASTM F 1674 - Standard Test Method for Joint Restraint Products for Use with PVC Pipe

M. AWWA C 206 - Standard for Field Welding of Steel Water Pipe

N. AWWA C 207 - Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 Inches through 144 Inches

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Conform to submittal requirements of applicable Section for type of pipe used.

C. Photographs: Submit photographs conforming to requirements of Division 1 prior to commencement of construction.

D. Submit videotapes conforming to requirements of Division 1, if applicable.

E. Submit Lone Star notification transmittal number prior to beginning excavation.

F. Submit, a minimum of 15 days before beginning pipe laying operations, layout drawing identifying proposed sections for disinfecting, hydrostatic testing and site restoration for entire project for review and approval. Layout drawing to identify sequence of sections for:

1. Disinfection; not to exceed 4,000 linear feet per section.
2. Hydrostatic testing and transfer of services; to immediately follow sequence of disinfected section.
3. Site restoration; not to exceed limits specified; Sequence in order of disturbance.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Install pipe materials which conform to Division 33.

B. Conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 and have certified by an organization accredited by ANSI.

C. Type of pipe materials used is Contractor's option unless specifically identified on Drawings.

D. Provide minimum of 3/8 inch inside joint recess between ends of pipe in straight pipe sections.

2.2 WELDED JOINT PROTECTION FITTING FOR SMALL DIAMETER STEEL PIPE

A. Cylindrical Corrosion Barrier: Provide approved cylindrical corrosion barrier.

B. O-rings: Conform to National Sanitary Foundation requirements.

2.3 RESTRAINED JOINTS

A. Ductile-Iron Pipe: See Division 33.

B. PVC Pipe: See Division 33. Perform hydrostatic testing in accordance with ASTM F 1674.

C. Prestressed Concrete Cylinder Pipe, Bar-Wrapped Pipe and Steel Pipe: Welded joints (see Paragraph 3.06 D).

D. Restrained Joints where required on DIP and PVC pipe:

1. Restraint devices: Manufacture of high strength ductile iron, ASTM A 536 up to 24 inches, and ASTM A 36 for sizes greater than 30 inches. Working pressure rating twice that of design test pressure.
2. Bolts and connecting hardware: High strength low alloy material in accordance with ANSI A21.11/AWWA C111.

2.4 COUPLINGS AND APPURTENANCES FOR LARGE DIAMETER WATERLINE

A. Flexible (Dresser-type) Couplings.

1. Install where shown on Drawings or where allowed by Owner's Representative for Contractor's convenience. Use galvanized flexible couplings when installed on galvanized pipe which is cement lined, or when underground. Provide gaskets manufactured from Neoprene or Buna-N.
2. For steel pipe; provide approved sleeve-type flexible couplings. Thickness of middle ring equal to or greater than thickness of pipe wall.

3. Provide approved flanged adapter couplings for steel pipe.
4. Use Type 316 stainless steel bolts, nuts and washers where flexible couplings are installed underground. Coat entire coupling with 20-mil of approved coal tar coating.

B. Flap Valves: Provide approved flap valves on discharge of manhole drainline as shown on Drawings.

1. Body and Flap: ASTM A 126-B cast iron.
2. Seats: ASTM B 21-CA482 or ASTM B 301-CA145 bronze.
3. Resilient Seat
4. Hinge Arms: ASTM B 584-CA865 high tensile bronze.
5. Hinge pins: ASTM B 98-CA655 silicon bronze.

PART 3 EXECUTION

3.1 PREPARATION

A. Conform to applicable installation specifications for types of pipe used.

B. Employ workmen who are skilled and experienced in laying pipe of type and joint configuration being furnished. Provide watertight pipe and pipe joints.

C. Lay pipe to lines and grades shown on Drawings.

D. Confirm that nine feet minimum separation from gravity sanitary sewers and manholes or separation of four feet minimum from force mains as specified in this Section in all directions unless special design is provided on Drawings.

E. Where above clearances cannot be attained, and special design has not been provided on Drawings, obtain direction from Owner's Representative before proceeding with construction.

F. Inform Owner's Representative if unmetered sprinkler or fire line connections exist which are not shown on Drawings. Make transfer only after approval by Owner's Representative.

G. For projects involving multiple subdivisions or locations, limit water line installation to maximum of two project site locations. Maximizing 2 pipe installation crews shall be permitted, unless otherwise approved by Owner's Representative.

H. Only the appropriate governing agency will handle operations involving opening and closing valves for wet connections and for chlorination. Contractor is responsible for handling necessary installations and removal of chlorination and testing taps and risers.

I. If asbestos-cement (A.C.) pipe is encountered, follow safety practices outlined in American Water Works Association's publication, "Work Practices for A/C Pipe". Strictly adhere to "recommended practices" contained in this publication and make them "mandatory practices" for this Project.

J. For pipe diameters 36 inches and greater, clearly mark each section of pipe and fitting with unique designation on inside of pipe along with pressure class. Locate unique identifying mark minimum of five feet away from either end of each section of pipe. Provide one unique identifying mark in middle of each fitting. Place markings at consistent locations.
Use permanent black paint and minimum letter height of 4 inches to mark designations.

K. Contractor is responsible for assuring chosen manufacturer fulfills requirements for extra fittings and, therefore, is responsible for costs due to downtime if requirements are not met.

L. Do not remove plugs or clamps during months of peak water demands; June, July and August, unless otherwise approved by Owner's Representative.

3.2 HANDLING, CLEANING AND INSPECTION

A. Handling:

1. Place pipe along project site where storm water or other water will not enter or pass through pipe.
2. Load, transport, unload, and otherwise handle pipe and fittings to prevent damage of any kind. Handle and transport pipe with equipment designed, constructed and arranged to prevent damage to pipe, lining and coating. Do not permit bare chains, hooks, metal bars, or narrow skids or cradles to come in contact with coatings. Where required, provide pipe fittings with sufficient interior strutting or cross bracing to prevent deflection under their own weight.
3. Hoist pipe from trench side into trench by means of sling of smooth steel cable, canvas, leather, nylon or similar material.
4. For large diameter water lines, handle pipe only by means of sling of canvas, leather, nylon, or similar material. Sling shall be minimum 36 inches in width. Do not tear or wrinkle tape layers.
5. Use precautions to prevent injury to pipe, protective linings and coatings.
   a. Package stacked pipe on timbers. Place protective pads under banding straps at time of packaging.
   b. Pad fork trucks with carpet or other suitable material. Use nylon straps around pipe for lift when relocating pipe with crane or backhoe.
   c. Do not lift pipe using hooks at each end of pipe.
   d. Do not place debris, tools, clothing, or other materials on pipe.
6. Repair damage to pipe or protective lining and coating before final acceptance.
7. For cement mortar line and coated steel pipe and PCCP, permit no visible cracks longer than 6 inches, measured within 15 degrees of line parallel to pipe longitudinal axis of finished pipe, except:
   a. In surface laitance of centrifugally cast concrete.
   b. In sections of pipe with steel reinforcing collars or wrappers.
   c. Within 12 inches of pipe ends.
8. Reject pipe with visible cracks (not meeting exceptions) and remove from project site.

B. Cleaning: Thoroughly clean and dry interior of pipe and fittings of foreign matter before installation, and keep interior clean until Work has been accepted. Keep joint contact surfaces clean until jointing is completed. Do not place debris, tools, clothing or other materials in pipe. After pipe laying and joining operations are completed, clean inside of pipe and remove debris.

C. Inspection: Before installation, inspect each pipe and fitting for defects. Reject defective, damaged or unsound pipe and fittings and remove them from site.

3.3 EARTHWORK

A. Conform to applicable provisions of Division 31.

B. Bedding: Use bedding materials in conformance with Division 31.

C. Backfill: Use bank run sand or earth or native soil as specified in Division 31. Backfill excavated areas in same day excavated. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

D. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density Water tamping is not allowed.

E. Pipe Embedment: Including 6-inch pipe bedding and backfill to 12 inches above top of pipe.

3.4 PIPE CUTTING

A. Cut pipe 12 inches and smaller with standard wheel pipe cutters. Cut pipe larger than 12 inches in manner approved by Owner's Representative. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.5 PIPING INSTALLATION

A. General Requirements:

1. Lay pipe in subgrade free of water.
2. Make adjustments of pipe to line and grade by scraping away subgrade or filling in with granular material.
3. Properly form bedding to fully support bell without wedging or blocking up bell.
4. Open Cut Construction: Keep pipe trenches free of water which might impair pipe laying operations. Grade pipe to provide uniform support along bottom of pipe. Excavate for bell holes after bottom has been graded and in advance of placing pipe. Lay not more than nominal city block length of not more than 300 feet of pipe in trench ahead of backfilling operations. Cover or backfill laid pipe if pipe laying operations are interrupted and during non-working hours. Place backfill carefully and simultaneously on each side of pipe to avoid lateral displacement of pipe and damage to joints. If adjustment of pipe is required after it has been laid, remove and re-lay as new pipe.

B. Install pipe continuously and uninterrupted along each street on which work is to be performed. Obtain approval of Owner's Representative prior to skipping any portion of Work.

C. Protection of Pipeline: Securely place stoppers or bulkheads in openings and in end of line when construction is stopped temporarily and at end of each day's work.

D. Perform Critical Location as shown on Drawings. Refer to Division 33 for additional requirements at critical locations.

E. Laying Large Diameter Water Line

1. Lay not more than 50 feet of pipe in trench ahead of backfilling operations.
2. Dig trench proper width as shown. When trench width below top of pipe becomes 4 feet wider than specified, install higher class of pipe or improved bedding, as determined by Owner's Representative. No additional payment will be made for higher class of pipe or improved bedding.
3. Use adequate surveying methods and equipment; employ personnel competent in use of this equipment. Horizontal and vertical deviations from alignment as indicated on Drawings shall not exceed 0.10 feet. Measure and record "as-built" horizontal alignment and vertical grade at maximum of every 100 feet on record drawings.
4. Prevent damage to coating when placing backfill. Use backfill material free of large rocks or stones, or other material which could damage coatings.
5. Before assembling couplings, lightly coat pipe ends and outside of gaskets with cup grease or liquid vegetable soap to facilitate installation.
6. Prior to proceeding with critical tie-ins submit sequence of work based on findings from "critical location" effort.

F. Perform following additional procedures when working on plant sites.

1. Seventy-two hours prior to each plant shut down or connection, schedule coordination meeting with Owner's Representative and Water Production personnel. At this meeting, present proposed sequencing of Work and verification of readiness to complete Work as required and within time permitted. Do not proceed with Work until Owner's Representative agrees key personnel, equipment and materials are on hand to complete Work.
2. Prior to fully excavating around existing piping, excavate as minimal as possible to confirm type and condition of existing joints. Verify size, type, and condition of pipe prior to ordering materials or fully mobilizing for Work.

3. Do not proceed with connections to existing piping and identified critical stages of work unless approved by Owner's Representative and the governing agency is present to observe.
4. Coordinate with the governing agency to obtain reduction in operating pressures prior to performing connections to existing piping.
5. Make connections to existing piping only when two valves are closed off between connection and source of water pressure. Do not make connection relying solely on one valve, unless otherwise approved by Owner's Representative.
6. Perform critical stages of Work identified on Drawings at night or during low water demand months as specified in Division 1.
7. Excavation equipment used on plant sites to have smooth bucket; no teeth or side cutters.
8. Submit to Owner's Representative Lone Star Notification transmittal number prior to beginning excavation.
9. Before each "dig" with mechanical excavator, probe ground to determine potential obstructions. Repeat procedure until existing pipe is located or excavation reaches desired elevation. Perform excavations within one foot to existing piping by hand methods.
10. Provide adequate notice to pipe manufacture's representative when connecting or modifying existing prestressed or pretension concrete cylinder pipe.
11. Provide field surveyed (horizontal and vertical elevations) "as-builts" of new construction and existing underground utilities encountered. Submit in accordance with Division 1.
12. Prior to performing plant work to be done on weekend, provide list of sites and contact person with phone numbers to Owner's Representative by noon on Thursday of week. Contact person must be accessible during weekend, have Houston Metro Area phone number, and be authorized to make emergency decisions.
13. No night work or plant shut down will be scheduled to begin two working days before or after designated Holidays.

G. For tie-ins to existing water lines, provide necessary material on hand to facilitate connection prior to shutting down existing water line. Provide governing agency a minimum of two weeks notice prior to shutting down existing water line.

3.6 JOINTS AND JOINTING

A. Rubber Gasketed Bell-and-Spigot Joints for Concrete Cylinder Pipe, Bar Wrapped Pipe PVC, Steel, and DIP:

1. After rubber gasket is placed in spigot groove of pipe, equalize rubber gasket cross section by inserting tool or bar recommended by manufacturer under rubber gasket and moving it around periphery of pipe spigot.
2. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.
3. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.
4. After pipe sections are joined, check gaskets to ensure that no displacement of gasket has occurred. If displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket, inspect for damage and replace if necessary before remaking joint.
5. Where preventing movement of 16-inch diameter or greater pipe is necessary due to thrust, use restrained joints as shown on Drawings.
   a. Include buoyancy conditions for soil unit weight when computing thrust restraint calculations.
   b. Do not include passive resistance of soil in thrust restraint calculations.
6. Except for PVC pipe, provide means to prevent full engagement of spigot into bell as shown on Drawings. Means may consist of wedges or other types of stops as approved by Owner's Representative.

B. Flanged Joints where required on Concrete Cylinder Pipe, Bar Wrapped Pipe, Ductile Iron Pipe, or Steel Pipe:

1. AWWA C 207. Prior to installation of bolts, accurately center and align flanged joints to prevent mechanical prestressing of flanges, pipe and equipment. Align bolt holes to straddle vertical,

horizontal or north-south center line. Do not exceed 3/64 inch per foot inclination of flange face from true alignment.

2. Use full-face gaskets for flanged joints. Provide 1/8-inch-thick cloth inserted rubber gasket material. Cut gaskets at factory to proper dimensions.
3. Use galvanized or black nuts and bolts to match flange material. Use cadmium-plated steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Maintain at all times approximately same distance between two flanges at points around flanges. Tighten bolts alternately (180° apart) until all are evenly tight. Draw bolts tight to ensure proper seating of gaskets. Provide Densco petroleum based tape or approved equal for all exposed portions of nuts, bolts and pipe.
4. Full length bolt isolating sleeves and washers shall be used with flanged connections. Furnish kits in accordance with City of Houston's "Approved Products List."
5. For in-line flange joints 30 inches in diameter and greater and at butterfly valve flanges, provide Pyrox G-10 with nitrite seal, conforming to ANSI A 21.11 mechanical joint gaskets. For in-line flange joints sized between 12 inches in diameter and greater and 24 inches in diameter and smaller, provide Phenolic PSI with nitrite seal gasket conforming to ANSI A 21.11 mechanical joint gaskets.

C. Welded Joints (Concrete Cylinder Pipe, Bar Wrapped Pipe, Steel Pipe):

1. Prior to starting work, provide certification of qualification for welders employed on project for type of work procedures and positions involved.

2. Joints: AWWA C 206. Full-fillet, single lap-welded slip-type either inside or outside, or double butt-welded type; use automatic or hand welders; completely penetrate deposited metal with base metal; use filler metal compatible with base metal; keep inside of fittings and joints free from globules of weld metal which would restrict flow or become loose. Do not use mitered joints. For interior welded joints, complete backfilling before welding. For exterior field-welded joints, provide adequate working room under and beside pipe. Use exterior welds for 30-inch and smaller.
Furnish welded joints with trimmed spigots and interior welds for 36-inch and larger pipe.
Bell-and-spigot, lap-welded slip joints: Deflection may be taken at joint by pulling joint up to 3/4 inch as long as 1 % inch minimum lap is maintained. Spigot end may be miter cut to take deflections up to 5 degrees as long as joint tolerances are maintained. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to 5 degrees.
Align piping and equipment so that no part is offset more than 1/8 inch. Set fittings and joints square and true, and preserve alignment during welding operation. For butt welded joints, align abutting ends to minimize offset between surfaces. For pipe of same nominal wall thickness, do not exceed 1/16 inch offset. Use line-up clamps for this purpose; however, take care to avoid damage to linings and coatings.
Protect coal-tar-epoxy lining during welding by draping an 18-inch-wide strip of heat resistant material over top half of pipe on each side of lining holdback to avoid damage to lining by hot splatter. Protect tape coating similarly if external welding is required.
Welding rods: Compatible with metal to be welded to obtain strongest bond, E-70XX.
Deposit metal in successive layers to provide at least 2 passes or beads for automatic welding and 3 passes or beads for manual welding in completed weld.
Deposit no more than 1/4 inch of metal on each pass. Thoroughly clean each individual pass with wire brush or hammer to remove dirt, slag or flux.
Do not weld under weather condition that would impair strength of weld, such as wet surface, rain or snow, dust or high winds, unless work is properly protected.
Make tack weld of same material and by same procedure as completed weld. Otherwise, remove tack welds during welding operation.
Remove dirt, scale, and other foreign matter from inside piping before tying in sections, fittings, or valves.
Welded Joints for Large Diameter Water Lines:

a. Furnish pipe with trimmed spigots and interior welds for 36-inch and larger pipe.
b. Use exterior welds for 30 inch and smaller.
c. Only one end may be miter cut. Miter end cuts of both ends of butt-welded joints may be used for joint deflections of up to 2 % degrees.For large diameter water lines, employ an independent certified testing
laboratory, approved by Owner's Representative, to perform weld acceptance tests on welded joints. Include cost of such testing and associated work to accommodate testing in contract unit price bid for water line. Furnish copies of test reports to Owner's Representative for review. Owner's Representative has final decision as to suitability of welds tested.
1) Weld acceptance criteria:
a) Conduct in accordance with ASTM E165- Standard Test Method for Liquid Penetrant Examination and ASTM E709 Standard Guide for Magnetic Particle Examination. Use X-ray methods for butt welds, for 100 percent of joint welds.
b) Examine welded surfaces for the following defects:
(1) Cracking
(2) Lack of fusion/penetration
(3) Slag which exceeds one-third (t) where (t) equals material thickness
(4) Porosity/Relevant rounded indications greater than 3/16 inch; rounded indication is one of circular or elliptical shape with length equal to or less than three times its width
(5) Relevant linear indications in which length of linear indication exceeds three times its width
(6) Four or more relevant 1/16-inch rounded indications in line separated by 1/16 inch or less edge to edge

14. After pipe is joined and prior to start of welding procedure, make spigot and bell essentially concentric by jacking, shimming or tacking to obtain clearance tolerance around periphery of joint except for deflected joints.
15. Furnish each welder employed steel stencil for marking welds, so work of each welder can be identified. Mark pipe with assigned stencil adjacent to weld. When welder leaves job, stencil must be voided and not duplicated. Welder making defective welds must discontinue work and leave project site. Welder may return to project site only after recertification.
16. Provide cylindrical corrosion barriers for epoxy lined steel pipe 24-inch diameter and smaller, unless minimum wall thickness is 0.5 inches or greater.
a. In addition to welding requirements contained here in Paragraph 3.06, conform to protection fitting manufacturer's installation recommendations.
b. Provide services of technical representative of manufacturer available on site at beginning of pipe laying operations. Representative to train welders and advise regarding installation and general construction methods. Welders must have 12 months prior experience installing protection fittings.
c. All steel pipe is to have cutback 3/4 inch to no greater than 1 inch of internal diameter coating from weld bevel.
d. Furnish steel fittings with cylindrical corrosion barriers with shop welded extensions to end of fittings. Extension length to measure no less than diameter of pipe. Shop apply lining in accordance with AWWA C 210 or AWWA C 213.
e. All steel pipe receiving field adjustments are to be cold cut using standard practices and equipment. No cutting using torch is to be allowed.

D. Harnessed Joints (Concrete Cylinder Pipe, Bar Wrapped Pipe):

1. Use of snap-ring type restrained joints on pipe is limited to 20-inch through 48-inch diameters.
2. Position snap-ring joint bolt on top (12 o'clock portion). Provide minimum 1/2-inch joint recess. Use joint "diapers" minimum of 12 inches wide.
3. For field adjustments with deflections beyond manufacturer's recommendations: a. Field trim spigot.

b. Do not engage ring.

4. Harnessed joints are not permitted in areas defined on Drawings as potentially petroleum contaminated material, in tunnels, or at bend greater than 5 degrees.
5. Install harness type joints including snap rings at straight sections of pipe.

E. Restrained Joints

1. For existing water lines and water lines less than 16 inches in diameter, restrain pipe joints with concrete thrust blocks.
2. Thrust restraint lengths shown on Drawings are minimum anticipated lengths. These lengths are based on deflections indicated and on use of prestressed concrete cylinder pipe for large diameter lines and ductile iron pipe for small diameter lines. Adjustments in deflections or use of other pipe material may result in reduction or increase of thrust lengths. Perform calculations by pipe manufacturer to verify proposed thrust restraint lengths. Submit calculations for all pipe materials sealed by a registered Professional Engineer in State of Texas for review by Owner's Representative. Make adjustments in thrust restraint lengths at no additional cost to Owner.
3. Passive resistance of soil will not be permitted in calculation of thrust restraint.
4. For 16-inch lines and larger use minimum 16-foot length of pipe in and out of joints made up of beveled pipe where restraint joint lengths are not identified on Drawings. Otherwise, provide restraint joints for a minimum length of 16 feet on each side of beveled joints.
5. Installation.
   a. Install restrained joints mechanism in accordance with manufacturer's recommendations.
   b. Examine and clean mechanism; remove dirt, debris and other foreign material.
   c. Apply gasket and joint NSF 61 FDA food grade approved lubricant.
   d. Verify gasket is evenly seated.
   e. Do not over stab pipe into mechanism.
6. Prevent any lateral movement of thrust restraints throughout pressure testing and operation.
7. Place 2500 psi concrete conforming to Division 32, for blocking at each change in direction of existing water lines, to brace pipe against undisturbed trench walls. Finish placement of concrete blocking, made from Type I cement, 4 days prior to hydrostatic testing of pipeline. Test may be made 2 days after completion of blocking if Type II cement is used.

F. Joint Grout (Concrete Cylinder Pipe, Bar Wrapped Pipe, Steel Pipe):

1. Mix cement grout mixture by machine except when less than 1/2 cubic yard is required. When less than 1/2 cubic yard is required, grout may be hand mixed. Mix grout only in quantities for immediate use. Place grout within 20 minutes after mixing. Discard grout that has set. Retempering of grout by any means is not permitted.
2. Prepare grout in small batches to prevent stiffening before it is used. Do not use grout which has become so stiff that proper placement cannot be assured without retempering. Use grout for filling grooves of such consistency that it will adhere to ends of pipe.
3. Surface Preparation: Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces with wire brush or hammer to sound, clean surface. Remove rust and foreign materials from metal surfaces in contact with grout.
4. Follow established procedures for hot and cold weather concrete placement.
5. Complete joint grout operations and backfilling of pipe trenches as closely as practical to pipe laying operations. Allow grouted exterior joints to cure at least 1 hour before compacting backfill.
6. Grouting exterior joint space: Hold wrapper in place on both sides of joint with minimum 5/8-inch-wide steel straps or bands. Place no additional bedding or backfill material on either side of pipe until after grout band is filled and grout has mechanically stiffened. Pull ends of wrapper together at top of pipe to form access hole. Pour grout down one side of pipe until it rises on other side. Rod or puddle grout to ensure complete filling of joint recess. Agitate for 15 minutes to allow excess water to seep through joint band. When necessary, add more grout to fill joint completely. Protect gap at top of joint band from backfill by allowing grout to stiffen or by

covering with structurally protective material. Do not remove band from joint. Proceed with placement of additional bedding and backfill material.

7. Interior Joints for Pipe 24 inches and Smaller: Circumferentially butter bell with grout prior to insertion of spigot, strike off flush surplus grout inside pipe by pulling filled burlap bag or inflated ball through pipe with rope. After joint is engaged, finish off joint grout smooth and clean. Use swab approved by Owner's Representative for 20-inch pipe and smaller.
8. Protect exposed interior surfaces of steel joint bands by metallizing, by other approved coatings, or by pointing with grout. Joint pointing may be omitted on potable water pipelines if joint bands are protected by zinc metallizing or other approved protective coatings.
9. Remove and replace improperly cured or otherwise defective grout.
10. Strike off grout on interior joints and make smooth with inside diameter of pipe.
11. When installed in tunnel or encasement pipe and clearance within casing does not permit outside grout to be placed in normal manner, apply approved flexible sealer, such as Flex Protex or equal, to outside joint prior to joint engagement. Clean and prime surfaces receiving sealer in accordance with manufacturer's recommendations. Apply sufficient quantities of sealer to assure complete protection of steel in joint area. Fill interior of joint with grout in normal manner after joint closure.
12. Interior Joints for Water Lines 30 inches and Larger: Clean joint space, wet joint surfaces, fill with stiff grout and trowel smooth and flush with inside surfaces of pipe using steel trowel so that surface is smooth. Accomplish grouting at end of each work day. Obtain written acceptance from Owner's Representative of inside joints before proceeding with next day's pipe laying operation. During inspection, insure no delamination of joint mortar has occurred by striking joint mortar lining with rubber mallet. Remove and replace delaminated mortar lining.
13. Work which requires heavy equipment to be over water line must be completed before mortar is applied to interior joints.

G. Large Diameter Water Main Joint Testing: In addition to testing individual joints with feeler gauge approximately 1/2 inch wide and 0.015-inch thick, use other joint testing procedure approved or recommended by pipe manufacturer which will help ensure watertight installation prior to backfilling. Perform tests at no additional cost to Owner.

H. Make curves and bends by deflecting joints or other method as recommended by manufacturer and approved by Owner's Representative. Submit details of other methods of providing curves and bends which exceed manufacturer's recommended deflection prior to installation.

1. Deflection of pipe joints shall not exceed maximum deflection recommended by pipe manufacturer, unless otherwise indicated on Drawings.
2. If deflection exceeds that specified but is less than 5 percent, repair entire deflected pipe section such that maximum deflection allowed is not exceeded.
3. If deflection is equal to or exceeds 5 percent from that specified, remove entire portion of deflected pipe section and install new pipe.
4. Replace, repair, or reapply coatings and linings as required.
5. Assessment of deflection may be measured by Owner's Representative at location along pipe. Arithmetical averages of deflection or similar average measurement methods will not be deemed as meeting intent of standard.
6. When rubber gasketed pipe is laid on curve, join pipe in straight alignment and then deflect to curved alignment.

I. Closures Sections and Approved Field Modifications to Steel, Concrete Cylinder Pipe, Bar Wrapped Pipe and Fittings:

1. Apply welded-wire fabric reinforcement to interior and exterior of exposed interior and exterior surfaces greater than 6 inches in diameter. Welded-wire fabric: minimum W1; maximum spacing 2 inches by 4 inches; 3/8 inch from surface of steel plate or middle third of lining or coating thickness for mortar thickness less than 3/4 inch.
2. Fill exposed interior and exterior surfaces with nonshrink grout.
3. For pipe diameters 36 inches and greater, perform field welds on interior and exterior of pipe.

4. For large diameter water lines, provide minimum overlap of 4 inches of butt strap over adjacent piece on butt-strap closures.

3.7 CATHODIC PROTECTION APPURTENANCES

A. Where identified on Drawings, modify pipe for cathodic protection as detailed on Drawings and specified. Unless otherwise noted, provide insulation kits including test stations at connections to existing water system or at locations to isolate one type of cathodic system from another type, between water line, access manhole piping and other major openings in water line, or as shown on Drawings.

B. Bond joints for pipe installed in tunnel or open cut, except where insulating flanges are provided. Weld strap or clip between bell and spigot of each joint or as shown on Drawings. No additional bonding required where joints are welded for thrust restraint. Repair coating As specified by appropriate AWWA standard, as recommended by manufacturer, and as approved by Owner's Representative.

C. Bonding Strap or Clip: Free of foreign material that may increase contact resistance between wire and strap or clip.

3.8 SECURING, SUPPORTING AND ANCHORING

A. Support piping as shown on Drawings and as specified in this Section, to maintain line and grade and prevent transfer of stress to adjacent structures.

B. Where shown on Drawings, anchor pipe fittings and bends installed on water line by welding consecutive joints of pipe together to distance each side of fitting. Restrained length, as shown on Drawings, assumes that installation of pipe and subsequent hydrostatic testing begins upstream and proceed downstream, with respect to normal flow of water in pipe. If installation and testing differs from this assumption, submit for approval revised method of restraining pipe joints upstream and downstream of device used to test against (block valve, blind flange or dished head plug).

C. Use adequate temporary blocking of fittings when making connections to distribution system and during hydrostatic tests. Use sufficient anchorage and blocking to resist stresses and forces encountered while tapping existing water line.

3.9 POLYETHYLENE WRAP FOR DUCTILE IRON PIPE

A. Double wrap pipe and appurtenances (except fire hydrants and fusion bond or polyurethane coated fittings) with 8-mil polyethylene film.

B. Do not use polyethylene wrap if pipe is cathodically protected.

C. Conform to requirements of Division 33.

3.10 CLEANUP AND RESTORATION

A. Provide cleanup and restoration crews to work closely behind pipe laying crews, and where necessary, during disinfection and hydrostatic testing, service transfers, abandonment of old water lines, backfill and surface restoration.

B. Unless otherwise approved by Owner's Representative, comply with the following:

1. Once water line is installed to limits approved in layout submitted, immediately begin preparatory work for disinfection effort.
2. No later than three days after completing disinfection preparatory work, execute disinfection work.
3. Immediately after transfer of services, begin abandonment of old water lines and site restoration.
4. Do not exceed a total of 50% of total project linear feet of disturbed right-of-way and easement

until site is restored in accordance with Division 1.

5. Exceeding any of the above footage limitations shall be considered a material breach of the Contract and subject to termination in accordance with the General Conditions.

C. For large diameter water lines, do not install more than 2,000 linear feet of water line, without previous 2,000 linear feet being restored in accordance with Division 1. Schedule paving crews so repaving work will not lag behind pipe laying work by more than 1,000 linear feet. Failure to comply with this requirement shall be considered a material breach of the Contract and subject to termination in accordance with the General Conditions.

3.11 CLEANING PIPING SYSTEMS

A. Remove construction debris or foreign material and thoroughly broom clean and flush piping systems. Provide temporary connections, equipment and labor for cleaning. Owner's Representative must inspect water line for cleanliness prior to filling.

3.12 DISINFECTION OF WATER LINES

A. Conform to requirements of Division 33.

3.13 FIELD HYDROSTATIC TESTS

A. Conform to requirements of Division 33.

END OF SECTION 33 11 00

SECTION 33 12 13.10

TAPPING SLEEVES AND VALVES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tapping sleeves and valves for connections to existing water system.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.

B. ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

C. ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High- Pressure or High-Temperature Service.

D. AWWA C 110 - Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.

E. AWWA C 200 - Standard for Steel Water Pipe - 6 in. and Larger.

F. AWWA C 207 - Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 in. through 144 in.

G. AWWA C 500 - Standard for Metal Seated Gate Valves, for Water Supply Service.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit results of tapping sleeves NPT test opening.

C. Submit manufacturer's affidavit as required in Division!

1.5 DELIVERY, STORAGE AND HANDLING

A. Ship steel sleeves in wooden crates that provide protection from damage to epoxy coating during transport and storage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Tapping Sleeves:

1. Tapping Sleeve Bodies: AWWA C 110 cast or ductile iron or AWWA C 200 carbon steel in two

sections to be bolted together with high-strength, corrosion-resistant, low- alloy steel bolts with mechanical joint ends.

2. Branch Outlet of Tapping Sleeve:
   a. Flanged, machined recess, AWWA C 207, Class D, ANSI 150 pound drilling.
   b. Gasket: Affixed around recess of tap opening to prevent rolling or binding during installation.
3. Use cast iron split sleeve where fire service from 6-inch water line is approved.

B. Welded-steel tapping-sleeve bodies may be used in lieu of cast or ductile iron bodies for following sizes and with following restrictions:

1. Flange: AWWA C 207, Class D, ANSI 150 pound drilling.
2. Gasket: Affixed around recess of tap opening to prevent rolling or binding during installation.
3. Steel sleeves are restricted to use on pipe sizes 6 inches and larger.
4. Body: Heavy, welded-steel construction; top half grooved to retain neoprene O-ring seal permanently against outside diameter of pipe.
5. Bolts: AWWA C 500 Section 3.5; coated with 100 percent vinyl resin or corrosive resistant material.
6. Steel Sleeves Finish: Fusion-bonded epoxy coated to minimum 12 mil thickness.
7. Finished Epoxy Coat: Free of laminations and blisters; and remain pliant and resistant to impact with non-peel finish.
8. Provide approved steel tapping sleeves.
9. Tapping Sleeves: Provide with 3/4-inch NPT test opening for testing prior to tapping. Provide 3/4-inch bronze plug for opening.
10. Do not use steel sleeves for taps greater than 75 percent of pipe diameter.

C. Stainless Steel tapping-sleeve bodies and flange may be used in lieu of cast or ductile iron bodies for following sizes and with following restrictions:

1. Flange: ASTM A240 Stainless Steel, Type 304, ANSI 150 pound drilling.
2. Gasket: Full circumferential, affixed around recess of tap opening to prevent rolling or binding during installation, compounded for water and sewer service.
3. Stainless Steel sleeves are restricted to use on pipe sizes 4 inches and larger.
4. Body: ASTM A240 Stainless Steel, Type 304.
5. Bolts: ASTM A193 Stainless Steel, Type 304.
6. Nuts: ASTM A194 Stainless Steel, Type 304.
7. Branch Outlet: Heavy Stainless Steel Pipe.
8. Provide approved stainless steel tapping sleeves.
9. Do not use stainless steel sleeves for taps greater than 75 percent of pipe diameter.

D. Tapping Valves: Meet requirements of Division 33 with following exceptions:

1. Inlet Flanges:
   a. AWWA C 110; Class 125.
   b. AWWA C 110; Class 150 and higher: Minimum 8-hole flange.
2. Outlet: Standard mechanical or push-on joint to fit any standard tapping machine.
3. Valve Seat Opening: Accommodate full-size shell cutter for nominal size tap without contact with valve body; double disc.

E. Valve Boxes: Standard Type "A" valve boxes conforming to requirements of Division 33.

PART 3 EXECUTION

3.1 **APPLICATION**

A. Install tapping sleeves and valves at locations and of sizes shown on Drawings. Install sleeve so valve is in horizontally level position unless otherwise indicated on Drawings.

B. Clean tapping sleeve, tapping valve, and pipe prior to installation and in accordance with manufacturer's instructions.

C. Hydrostatically test installed tapping sleeve to 150 psig for minimum of 15 minutes. Inspect sleeve for leaks, and remedy leaks prior to tapping operation.

D. When tapping concrete pressure pipe, size on size, use shell cutter one standard size smaller than water line being tapped.

E. Do not use Large End Bell (LEB) increasers with next size tap unless existing pipe is asbestos-cement.

3.2 INSTALLATION

A. Verify outside diameter of pipe to be tapped prior to ordering sleeve.

B. Tighten bolts in proper sequence so that undue stress is not placed on pipe.

C. Align tapping valve properly and attach to tapping sleeve. Insert insulation sleeves into flange holes of tapping valve and pipe. Make insertions of sleeves on pipe side of tapping valve. Do not damage insulation sleeves during bolt tightening process.

D. Make tap with sharp, shell cutter:

1. For 12-inch and smaller tap, use minimum cutter diameter one-half inch less than nominal tap size.
2. For 16-inch and larger tap, use manufacturer's recommended cutter diameter.

E. Withdraw coupon and flush cuttings from newly-made tap.

F. Wrap:

1. For 12-inch and smaller tap, wrap completed tapping sleeve and valve in accordance with Division 2.
2. For 16-inch and larger tap, apply coal tar epoxy around completed tapping sleeve and valve. The coal tar epoxy shall be applied with minimum of two (2) coats. Each coat of coal tar epoxy shall have minimum dry film thickness of 16 mils.

G. Place concrete thrust block behind tapping sleeve (not over tapping sleeve and valve).

H. Request inspection of installation prior to backfilling.

I. Backfill in accordance with Division 31.

END OF SECTION 33 12 13.10

SECTION 33 12 13.12

WET CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet connections for new water mains and service lines to existing water mains.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 REFERENCES

A. AWWA C 800 - Underground Service Line Valves and Fittings.

1.4 DEFINITIONS

A. Wet connections consist of isolating sections of pipe to be connected with installed valves, draining the isolated sections, and completing the connections.

B. Connection of 2-inch or smaller lines, which may be referred to on Drawings as "2-inch standard connections" or "gooseneck connections" will be measured as 2-inch wet connections. This item is not to be used as part of a 2-inch service line.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe shall conform to requirements of applicable portions of Division 33 related to piping materials and to water distribution.

B. Corporation cocks and saddles shall conform to requirements in Division 33.

C. Valves shall conform to requirements of Section 33 12 16 - Water Utility Distribution Valves.

D. Brass fittings shall conform to requirements of AWWA C 800.

PART 3 EXECUTION

3.1 CONNECTION OPERATIONS

A. Plan wet connections in such manner and at such hours as to least inconvenience public. Notify Engineer at least 48 hours in advance of making connections.

B. Do not operate valves on mains in use by Owner. Owner Representative will handle, at no cost to Contractor, operations involving opening and closing valves for wet connections.

C. Conduct connection operations when Owner Representative is at job site. Connection work shall progress without interruption until complete once existing mains have been cut or plugs has been removed for making connections.

3.2 2-INCH WET CONNECTIONS

A. Tap water main. Use corporation cocks, saddles, copper tubing as required for line and grade adjustment, and brass fittings necessary to adapt to existing main. Use 2-inch valves when indicated on Drawings for 2-inch copper gooseneck connections.

END OF SECTION 33 12 13.12

SECTION 33 12 16

WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gate valves.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

B. ASTM B 62 - Standard Specification for Composition Bronze or Ounce Metal Casting.

C. ASTM D 429 - Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.

D. ASTM B 763 - Standard Specification for Copper Alloy Sand Casting for Valve Application.

E. AWWA C 500 - Standard for Metal-Seated Gate Valves for Water Supply Service.

F. AWWA C 509 - Standard for Resilient-Seated Gate Valves for Water Supply Service.

G. AWWA C 515- Standard for Reduced Wall, Resilient- Seated Gate Valves for Water Supply Service.

H. AWWA C 550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit manufacturer's product data for proposed valves for approval.

C. Provide detailed drawings of gearing mechanism for 20-inch and larger gate valves.

1.5 QUALITY CONTROL

A. Submit manufacturer's affidavit that gate valves are manufactured in the United States and conform to stated requirements of AWWA C 500, AWWA C 509, AWWA C 515, and this Section, and that they have been satisfactorily tested in the United States in accordance with AWWA C 500, AWWA C 509, and AWWA C 515.

PART 2 PRODUCTS

2.1 MATERIALS

A. Gate Valves: AWWA C 500, AWWA C 509, AWWA C 515 and additional requirements of this Section. Direct bury valves and those in subsurface vaults open clockwise; aboveground and plant valves open counterclockwise.
If type of valve is not indicated on Drawings, use gate valves as line valves for sizes 20-inches and smaller. When type of valve is indicated, no substitute is allowed.

Gate Valves 1-1/2 inches in Diameter and Smaller: 125 psig; bronze; rising-stem; single wedge; disc type; screwed ends.

Coatings for Gate Valves 2 inches and larger: AWWA C 550 non-toxic, imparts no taste to water, functions as physical, chemical, and electrical barrier between base metal and surroundings, minimum 8-mil-thick, fusion-bonded epoxy. Prior to assembly of valve, apply protective coating to interior and exterior surfaces of body.

Gate Valves 2 inches in diameter: Iron body, double disc or resilient-seated, non-rising stem, 150-pound test, 2-inch square nut operating clockwise to open.

Gate Valves 3 inches to 12 inches in diameter: Non-directional, standard-wall resilient seated (AWWA C 509), parallel seat double disc (AWWA C 500), or reduced-wall resilient seated gate valves (AWWA C 515), 200 psig pressure rating, bronze mounting, push-on bell ends with rubber joint rings, and nut-operated unless otherwise specified. Provide approved standard-wall resilient seated valves. Provide approved reduced-wall resilient seated valves. Provide approved double disc valves. Comply with following requirements unless otherwise specified in Drawings:

1. Design: Fully encapsulated rubber wedge or rubber seat ring mechanically attached with minimum 304 stainless-steel fasteners or screws; threaded connection isolated from water by compressed rubber around opening.
2. Body: Cast or ductile iron, flange bonnet and stuffing box together with ASTM A 307 Grade B bolts. Manufacturer's initials, pressure rating, and year manufactured shall be cast in body.
3. Bronze: Valve components in waterway to contain not more than 15 percent zinc and not more than 2 percent aluminum.
4. Stems: ASTM B 763 bronze, alloy number-995 minimum yield strength of 40,000 psi; minimum elongation in 2-inches of 12 percent, non-rising.
5. O-rings: For AWWA C 500, Section 3.12.2. For AWWA C 509, Sections 2.2.6 and 4.8.2. For AWWA C 515, Section 4.2.2.5.
6. Stem Seals Consist of three O-rings, two above and one below thrust collar with antifriction washer located above thrust collar for operating torque.

Stem Nut: Independent or integrally cast of ASTM B 62 bronze.

Resilient Wedge: Molded, synthetic rubber, vulcanized and bonded to cast or ductile iron wedge or attached with 304 stainless steel screws tested to meet or exceed ASTM D 429 Method B; seat against epoxy-coated surface in valve body.

Bolts: AWWA C 500 Section 3.4, AWWA C 509 Section 4.4 or AWWA C 515 Section 4.4.4; stainless steel; cadmium plated, or zinc coated.

Gate valves 14 inch and larger in Diameter: AWWA C 500; parallel seat double disc gate valves; push-on bell ends with rubber rings and nut-operated unless otherwise specified. Provide approved double disc valves with 150 psig pressure rating. Comply with following requirements unless otherwise specified on Drawings:

Body: Cast iron or ductile iron; flange together bonnet and stuffing box with ASTM A 307 Grade B bolts. Cast following into valve body manufacturer's initials, pressure rating, and year manufactured. When horizontally mounted, equip valves greater in diameter than 12 inches with rollers, tracks, and scrapers.

1. O rings: For AWWA C 500, Section 3.12.2. For AWWA C 515, Section 4.2.2.5.
2. Stems: ASTM B 763 bronze, alloy number-995 minimum yield strength of 40,000 psi; minimum elongation in 2-inches of 12 percent, non-rising.
3. Stem Nut: Machined from ASTM B 62 bronze rod with integral forged thrust collar machined to

size; non-rising.

4. Stem Seals: Consist of three O-rings, two above and one below thrust collar with antifriction washer located above thrust collar for operating torque.
5. Bolts: AWWA C 500 Section 3.4 or AWWA C 515 Section 4.4.4; stainless steel; cadmium plated, or zinc coated.
6. Discs: Cast iron with bronze disc rings securely penned into machined dovetailed grooves.
7. Wedging Device: Solid bronze or cast-iron, bronze-mounted wedges. Thin plates or shapes integrally cast into cast-iron surfaces are acceptable. Other moving surfaces integral to wedging action shall be bronze monel or nickel alloy-to-iron.
8. Provide bypass for valves 24 inches and larger.
9. Bronze Mounting: Built as integral unit mounted over, or supported on, cast-iron base and of sufficient dimensions to be structurally sound and adequate for imposed forces.
10. Gear Cases: Cast iron; furnished on 18-inch and larger valves and of extended type with steel side plates, lubricated, gear case enclosed with oil seal or O-rings at shaft openings.
11. Stuffing Boxes: Located on top of bonnet and outside gear case.

K. Gate valves 14 inches to 24 inches: Provide AWWA C 515; reduced-wall, resilient seated gate valves with 250 psig pressure rating. Furnish with spur or bevel gearing.

1. Mount valves horizontally if proper ground clearance cannot be achieved by normal vertical installation. For horizontally mounted gate valves, provide bevel operation gear mounted vertically for above ground operation.
2. Use valve body, bonnet, wedge, and operator nut constructed of ductile iron. Fully encapsulate exterior of ductile iron wedge with rubber.
3. Ensure wedge is symmetrical and seals equally well with flow in either direction.
4. Provide ductile iron operator nut with four flats at stem connection to apply even input torque to the stem.
5. Bolts: AWWA C515, Section 4.4.4, Stainless Steel; cadmium plated or zinc coated.
6. Provide high strength bronze stem and nut.
7. O-rings: AWWA C515, Section 4.2.2.5, pressure O-rings as gaskets.
8. Provide stem sealed by three O-rings. Top two O-rings are to be replaceable with valve fully open at full rated working pressure.
9. Provide thrust washers to the thrust collar for easy valve operation.

L. Gate Valves Extension Stem: When shown on Drawings, provide non-rising, extension stem having coupling sufficient to attach securely to operating nut of valve. Upper end of extension stem shall terminate in square wrench nut no deeper than 4 feet from finished grade or as shown on Drawings. Support extension stem with an arm attached to wall of manhole or structure that loosely holds extension stem and allows rotation in the axial direction only.

M. Gate Valves in Factory Mutual (Fire Service) Type Meter Installations: Conform to provisions of this specification; outside screw and yoke valves; carry label of Underwriters' Laboratories, Inc.; flanged, Class 125; clockwise to close.

N. Gate Valves for Tapping Steel Pipe: Provide double disc gate valve. Resilient wedge gate valve shall only be installed in a vertical position.

O. Provide flanged joints when valve is connected to steel or PCCP.

PART 3 EXECUTION

3.1 INSTALLATION

A. Earthwork. Conform to applicable provisions of Division 31.

B. Operation. Do not use valves for throttling without prior approval of manufacturer.

3.2 SETTING VALVES AND VALVE BOXES

A. Remove foreign matter from within valves prior to installation. Inspect valves in open and closed positions to verify that parts are in satisfactory working condition.

B. Install valves and valve boxes where shown on Drawings. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of 4 feet, or to undisturbed trench face when less than 4 feet. Install valves completely closed when placed in water line.

C. For pipe section of each riser, use only 6 inch, ductile iron Class 51, or DR18 PVC pipe cut to proper length. Riser must be installed to allow complete access for operation of valve.

D. Assemble and brace box in vertical position as indicated on Drawings.

3.3 DISINFECTION AND TESTING

A. Assist Owner's Representative with disinfection of valves and appurtenances as required by Division 33 and test as required by Division 33.

B. Double-Disc Gate Valves: Apply hydrostatic test pressure equal to twice rated working pressure of valve between discs. Valve shall show no leakage through metal, flanged joints, or stem seals. Test at rated working pressure, applied between discs. Valve shall show no leakage through metal, flanged joints, or stem seals. Do not exceed leakage rate of 1 oz/hr/inch of nominal valve size.

C. Solid-Wedge Gate Valves: Apply hydrostatic pressure equal to twice rated working pressure of valve with both ends bulkheaded and gate open. Valve shall show no leakage through metal, flanged joints, or stem seals. Test at rated working pressure, applied through bulkheads alternately to each side of closed gate with opposite side open for inspection. Valve shall show no leakage through metal, flanged joints, or stem-seals. Do not exceed leakage rate of 1 oz/hr/inch of nominal valve size.

D. Repair or replace valves which exceed leakage rate.

3.4 PAINTING OF VALVES

A. Paint valves in vaults, stations, and above ground with approved paint.

END OF SECTION 33 12 16

SECTION 33 12 19

WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire hydrants.

B. Adjustment of fire hydrants and gate valves.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. AWWA C 550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants

B. SSPC SP2 - Hand Tool Cleaning

C. SSPC SP3 - Power Tool Cleaning

D. SSPC SP10 - Near-White Blast Cleaning

E. SSPC SP11 - Power Tool Cleaning to Bare Metal

F. SSPC Paint Spec No.21

G. SSPC-Paint 21 - White or Colored Silicone Alkyd Paint

H. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

I. SSPC-Paint 104 - White or Tinted Alkyd Paint

J. Federal Standard A-A-2962A - Enamel, Alkyd, Solvent Based Low VOC

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit name of hydrant manufacturer, type of bonnet paint, and engineering control drawing number for hydrant proposed for use.

PART 2 PRODUCTS

2.1 HYDRANTS

A. Provide approved fire hydrants.

B. The Owner's Representative may, at any time prior to or during installation of hydrants, randomly select furnished hydrant for disassembly and laboratory inspection, at Owner's expense, to verify compliance with Specifications. When hydrant is found to be non- compliant, replace, at Contractor's expense, hydrants, with hydrants that comply with Specifications.

C. Provide lower hydrant barrel fabricated from Ductile Iron Pipe as single piece, connected to upper

hydrant barrel by means of joint coupling that will provide three hundred sixty degree (360) rotation of upper barrel.

2.2 LEADS

A. Branches (Leads): Conform to requirements of Division 33.

2.3 HYDRANT PAINTING

A. New hydrants and refurbished hydrants shall be shop coated as specified herein.

B. Exterior Above Traffic Flange (Including Bolts & Nuts).
1. Surface preparation to be in accordance with SSPC-SP 10 (MACE 2) near white blast cleaned surface.
2. Coat with three coat alkyd/silicone alkyd system with total dry film thickness (DFT) of 6 - 9 mils as follows:
   a. Prime Coat - Oil modified alkyd primer, to be in general conformance with SSPC Paint Specification No. 25. Total dry film thickness (DFT) 2 - 3 mils.
   b. Intermediate Coat - Heavy Duty Industrial Alkyd Enamel to be in general conformance with SSPC Paint Specification No. 104, and Federal Standard A- A-2962A. Total dry film thickness (DFT) of 2 -3 mils.
   c. Finish Coat - Silicone Alkyd Resin Enamelto be in general conformance with SSPC Paint Specification No. 21. Total dry film thickness (DFT) to be 2 - 3 mils. Exception - hydrant bonnet shall not be finished shop coated, only intermediate coated. Install color coded finish coating of bonnet in field.
   d. Bonnet Paint - Field apply finish coat of Silicone Alkyd Resin Enamel to be in general conformance with SSPC Paint Specification No. 21. Dry film thickness of 2 - 3 mils. Bonnet colors are to be as specified in Paragraph 3.01 to designate the appropriate size of water supply line.
3. Colors - Primer: Manufacturers standard color. Finish coat of hydrant body : As specified by Owner . Connection caps: Finished coated white. Paint white band of finish coat two (2) inches in width on hydrant body approximately six inches (6") above and parallel to traffic flange. Intermediate coat: Contrasting color to blue finish, such as white.

C. Field Maintenance Painting (Exterior Above Traffic Flange)

1. Surface Preparation to be in accordance with SSPC - SP2, Hand Tool Cleaning, or SSPC - SP3, Power Tool Cleaning, depending on condition of existing paint and extent of corrosion. It is not necessary to remove tightly adhered mill scale, rust, and paint. Mill scale, rust and paint are considered tightly adherent when they cannot be removed with dull putty knife. In some severe cases where it is necessary to remove majority of existing paint, surface should be cleaned in accordance with SSPC -SP11, Power Tool Cleaning to Bare Metal.

2. When surface is cleaned to bare metal (SSPC - SP11), coat hydrant with three coat Alkyd/Silicone Alkyd system in accordance with Paragraph 2.03.B.2 as for new hydrants. When surface is cleaned to SSPC - SP2 or SSPC - SP3, coat hydrant with Silicone Alkyd Resin Enamelin general conformance with SSPC Paint Specification No. 21. Total dry film thickness of 3 - 6 mils.

D. Exterior Below Traffic Flange
1. Surface preparation in accordance with SSPC- SP10 (MACE 2) Near White Blast Cleaned Surface.
2. Primer and intermediate coat: coal tar epoxy in general conformance with SSPC Paint Specification No. 16. Apply two (2) coats with dry film thickness (DFT) of 8 - 10 mils each for total DFT of 16 -20 mils.
3. Finish coat: Water based vinyl acrylic mastic Apply one coat with dry film thickness of 6 - 8 mils.

Color of finish coat to be same as finish coat for exterior above traffic flange, i.e., blue. (Acro 555 Crystal Blue, or equivalent.)

E. Interior Surfaces Above and Below Water Line Valve

1. Material used for internal coating of hydrant interior ferrous surfaces below water line valve must be NSF certified as suitable for contact with potable water as required by Chapter 290, Rules and Regulations for Public Water Systems, Texas Natural Resources Conservation Commission.
2. Coating shall be liquid or powder epoxy system in accordance with AWWA Standard C - 550 (latest revision). Coating may be applied in two or three coats, according to manufacturer's recommendations, for total dry film thickness of 12 -18 mils.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set fire hydrant plumb and brace at locations and grades as shown on Drawings. When barrel of hydrant passes through concrete slab, place 1-inch-thick piece of standard sidewalk expansion joint material around section of barrel passing through concrete.

B. Locate nozzle center line minimum 18 inches above finish grade.

C. Place 12-inch by 12-inch yellow indicators (plastic, sheet metal, plywood, or other material approved by Owner's Representative) on pumper nozzles of new or relocated fire hydrants installed on new water lines not in service. Remove indicators after new water line is tested and approved by Owner's Representative.

D. Do not cover drain ports when placing concrete thrust block.

E. Obtain Owner's Representative's approval in writing prior to installation of hydrants which require changes in bury depth due to obstructions not shown on Drawings. Unit price adjustments will not be allowed for changes in water line flow line or fire hydrant barrel length caused by obstructions.

F. Plug branch lines to valves and fire hydrants shown on Drawings to be removed. Deliver fire hydrants designated for salvage to nearest Utility Maintenance Quadrant Facility.

G. Install branches (leads) in accordance with Division 33.

H. Coating Requirements:

1. Apply coatings in strict accordance with manufacturer's recommendations. No requirements of this specification shall cancel or supersede written directions and recommendations of specific manufacturer so as to jeopardize integrity of applied system.
2. Furnish affidavit of compliance that coatings furnished complies with requirements of this specification and referenced standards, as applicable.

I. Field coat hydrant bonnet to indicate size of water line supplying hydrant or tested flow at the fire hydrant as directed by the Fire Marshall or Owner.

J. Remove and dispose of unsuitable materials and debris in accordance with requirements of Division 1.

END OF SECTION 33 12 19

SECTION 33 12 40

VALVE BOXES, METER BOXES, AND METER VAULTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Valve boxes for water service.

B. Meter boxes for water service.

C. Meter vaults for water service.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM A 48 - Standard Specification for Gray Iron Castings.

B. ASTM D 256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

C. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

D. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

E. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

F. ASTM D 2240 - Standard Test Method for Rubber Property-Durometer Hardness.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit manufacturers' product data for following items for approval:

1. Each type of valve box and lid.
2. Each type of meter box and cover.
3. Each type of meter vault frame and cover.

C. Submit design calculations and shop drawings for precast vault elements, sealed by an Engineer registered in State of Texas.

D. Submit shop drawings for cast-in-place meter vaults for approval if proposed construction varies from Drawings.

E. Submit manufacturer's certification that plastic meter boxes meet requirements of Paragraph 2.05, Plastic Meter Boxes.

PART 2 PRODUCTS

2.1 VALVE BOXES

A. Provide approved Type A, cast-iron/ductile-iron, slide-type, valve boxes. Design of valve box shall minimize stresses on valve imposed by loads on box lid.

B. Cast letter “W” into lid, 1/2 inch in height and raised 3/32 inch, for valves serving potable water lines.

C. Unless otherwise specified, uncoated cast iron.

D. Riser Pipe.

1. Provide 6-inch PVC, Class 150, DR 18, riser pipes in accordance with Division 33 or
2. 6-inch ductile-iron, thickness Class 51 riser pipes in accordance with Division 33.
3. Provide single section of pipe.

E. Concrete for valve box placement:

1. For locations in new concrete pavement, provide strength and mix design of new pavement.
2. For other locations, provide concrete for sidewalks conforming to requirements of Division 32.

2.2 METER BOXES

A. Provide meter boxes as required by the governing authority and as shown on the drawings.

2.3 CAST-IRON METER BOXES

A. Cast-Iron Boxes: Clean and free from sand blow-holes or other defects conforming to requirements of ASTM A 48, Class 30B. Bearing surfaces shall be machined so that covers seat evenly in frames.

B. Boxes and lids shall have dipped, coal-tar-pitch, varnish finish.

C. Provide lock-type meter boxes when required by Drawings. Lock mechanisms shall work with ease.

2.4 CONCRETE METER BOXES

A. Concrete Meter Boxes: Made of Class A concrete, with minimum 4000 psi compressive strength, conforming to requirements of Division 32. Construct to dimensions shown on Drawings.

B. Castings: Free from fractures, large or deep cracks, blisters or surface roughness or any other defects that may affect serviceability.

2.5 PLASTIC METER BOXES

A. Plastic Meter Boxes: Made of high density polyethylene conforming to the following ASTM standards:

ASTM	REQUIREMENT
D 256	Impact Strength = 1/9 ft.-lb./inch (Izod, Notched)
D 256	Impact Strength - 6.4 ft.-lb./inch (Izod, Un-Notched)
D 638	Tensile Strength (2.0 min.) = 3400 psi
D 648	Deflection Temperature = 170 degrees F
D 2240	Shore D, Hardness, 55-65 Impact Strength, Falling Dart Method, 160 inch- lb.
D 790	Flexural Modulus = 90,000 psi

B. Meter boxes shall meet the following test requirements:

1. Static Load: Not less than 2500 pounds using 6-inch disc with direct compression exerted at center of top of meter box with solid plastic lid.
2. Deflection: Not less than 1000 pounds load required to deflect top edge of meter box 1/8- inch.
3. Meter box body, without lid, shall weigh approximately 7 pounds.

2.6 METER VAULTS

A. Meter vaults may be constructed of precast concrete, cast-in-place concrete, or common brick masonry unless a specific type of construction is required by Drawings.

B. Concrete for Meter Vaults: Class A concrete, conforming to requirements of Division 32 with minimum compressive strength of 4000 psi at 28 days.

C. Reinforcing steel for meter vaults: Conform to requirements of Division 32.

D. Grates and Covers: Conform to requirements of Division 33.

PART 3 EXECUTION

3.1 EXAMINATION

A. Obtain approval from Owner's Representative for location of meter vault.

B. Verify lines and grade are correct.

C. Verify compacted subgrade will support loads imposed by vaults.

3.2 VALVE BOXES

A. Install riser pipe with suitable length for depth of cover indicated on Drawings or to accommodate actual finish grade.

1. Install with bell on top of valve.
2. Place riser pipe in plumb, vertical position.

B. Install valve box and riser piping plumbed in a vertical position. Provide 6-inches telescoping freeboard space between riser pipe top butt end, and interior contact flange of valve box, for vertical movement damping. End of pipe resting on valve shall be notched out sufficiently to provide a snug fit around the valve bonnet and to center valve inside of pipe.

C. Set, align, and adjust valve box so that lid is level with final grade.

D. Paint covers of new valve boxes in fluorescent orange when installed. After completion and acceptance by Owner, repaint covers black.

3.3 METER BOXES

A. Install cast iron or plastic boxes in accordance with manufacturer's instructions.

B. Construct concrete meter boxes to dimensions shown on Drawings.

C. Adjust top of meter boxes to conform to cover elevations specified in Paragraph 3.05, Frame and Cover for Meter Vaults.

D. Do not locate under paved areas unless approved by Owner's Representative. Use approved traffic-type box with cast iron lid when meter must be located in paved areas.

3.4 METER VAULTS

A. Construct concrete meter vaults to dimensions shown on Drawings. Do not cast in presence of water. Make bottom uniform. Verify lines and grades are correct and compacted subgrade will support loads imposed by vaults.

B. Precast Meter Vaults:

1. Install precast vaults in accordance with manufacturer's recommendations. Set level on a minimum 3-inch-thick bed of sand conforming to requirements of Division 31.
2. Seal lifting holes with cement-sand mortar or non-shrink grout.

C. Meter Vault Floor Slab:

1. Construct floor slabs of 6-inch-thick reinforced concrete. Slope floor 1/4 inch per foot toward sump. Make sump 12 inches in diameter, or 12 inches square, and 4 inches deep, unless other dimensions are required by Drawings. Install dowels at maximum of 18 inches, center-to-center for keying walls to floor slab.

2. Precast floor slab elements may be used for precast vault construction.

D. Cast-in-Place Meter Vault Walls:

1. Key walls to floor slab and form to dimensions shown on Drawings. Minimum wall thickness shall be 4 inches.
2. Cast walls monolithically. One cold joint will be allowed when vault depth exceeds 12 feet.
3. Set frame for cover in concrete.

3.5 FRAME AND COVER FOR METER VAULTS A. Set cast iron frame in a mortar bed

and adjust elevation of cover as follows:

1. In unpaved areas, set top of meter box or meter vault cover 2 to 3 inches above natural grade.
2. In paved areas, set top of meter box or meter vault cover flush with adjacent concrete but no higher than 1/2-inch.

3.6 BACKFILL

A. Provide bank run sand in accordance with Division 31 and backfill and compact in accordance with Division 31.

B. In unpaved areas, slope backfill around meter boxes and vaults to provide a uniform slope 1-to-5 slope from top to natural grade.

C. In paved areas, slope concrete down from meter box or vault to meet adjacent paved area.

END OF SECTION 33 12 40

SECTION 33 13 00

DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disinfection of potable water lines.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. AWWA C 651 - Standard for Disinfecting Water Mains.

PART 2 PRODUCTS -Not Used

PART 3 EXECUTION

3.1 CONDUCTING DISINFECTION

A. Promptly disinfect water lines constructed before tests are conducted on water lines and before water lines are connected to Public water distribution system.

B. Contractor shall provide water for disinfection at no additional charge to the Owner.

C. Unless otherwise provided in Contract Documents, Contractor will conduct disinfection operations.

D. Coordinate chlorination operations through Owner's Representative.

3.2 PREPARATION

A. Provide temporary blind flanges, cast-iron sleeves, plugs, necessary service taps, copper service leads, risers and jumpers of sizes, location and materials, and other items needed to facilitate disinfection of new water lines prior to connection to Public water distribution system. Normally, each valved section of water line requires two each 3/4-inch taps. A 2-inch minimum blow-off is required for water lines up to and including 6-inch diameter.

B. Use fire hydrants as blow-offs to flush newly constructed water lines 8 inch diameters and above. Where fire hydrants are not available on water lines, install temporary blow-off valves and remove promptly upon successful completion of disinfection and testing.

C. Slowly fill each section of pipe with water in manner approved by Owner's Representative. Average water velocity when filling pipeline should be less than one foot per second and shall not, under any circumstance, exceed 2 feet per second. Before beginning disinfection operations, expel air from pipeline.

D. Backfill excavations immediately after installation of risers or blow-offs.

E. Install blow-off valves at end of water line to facilitate flushing of dead-end water lines. Install permanent blow-off valves according to drawings.

3.2 DISINFECTION BY CONTRACTOR

A. The following procedure will be used when disinfection by Contractor is required by Contract Documents:

1. Use not less than 100 parts of chlorine per million parts of water.
2. Introduce chlorinating material to waterlines in accordance with AWWA C651.
3. After contact period of not less than 24hours, flush system with clean water until residual chlorine is no greater than 1.0 parts per million parts of water.
4. Open and close valves in lines being sterilized several times during contact period.
5. If chemical compound is used for sterilizing agent, place in pipes as directed by Owner's Representative.

3.3 BACTERIOLOGICAL TESTING

A. After disinfection and flushing of water lines, bacteriological tests will be performed by the governing agency or testing laboratory in accordance with Division 1. When test results indicate need for additional disinfection of water lines based upon Texas Department of Health requirements, assist Contractor shall provide additional disinfection operations at no additional cost to the Owner.

3.4 COMPLETION

A. Upon completion of disinfection and testing, remove risers except those approved for use in subsequent hydrostatic testing, and backfill excavation promptly.

END OF SECTION 33 13 00

SECTION 33 13 00.10

HYDROSTATIC TESTING OF PIPELINES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field hydrostatic testing of newly installed water pipelines.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. Disinfect water system pipelines prior to hydrostatic testing.

B. Hydrostatically test newly installed water pipelines after disinfection, when required, and before connecting to Public water distribution system.

C. Water for testing will be charged to Contractor in accordance with applicable Ordinances. Prior to hydrostatic testing, obtain a transient meter from the appropriate governing authority. Contractor shall pay all fees associated with transient meter.

D. Test pipelines in lengths between valves, or plugs, of not more than 4,000 feet.

E. Conduct hydrostatic tests in presence of Owner's Representative.

3.2 TEST PROCEDURES

A. Furnish, install, and operate connections, pump, meter and gages necessary for hydrostatic testing.

B. Allow pipeline to sit minimum of 24 hours from time it is initially disinfected until testing begins, to allow pipe wall or lining material to absorb water. Periods of up to 7 days may be required for mortar lining to become saturated.

C. For small diameter pipelines, expel air and apply minimum test pressure of 125 psi. For large diameter water lines, expel air and apply minimum test pressure of 150 psi.

D. Begin test by 9:00 a.m. unless otherwise approved by Owner's Representative. Maintain test pressure for 8 hours. When large quantity of water is required to maintain pressure during test, discontinue testing until cause of water loss is identified and corrected.

E. Keep valves inside pressure reducing stations closed during hydrostatic pressure test.

3.3 ALLOWABLE LEAKAGE FOR WATERLINES

A. During hydrostatic tests, no leakage will be allowed for sections of water lines consisting of welded joints.

B. Maximum allowable leakage for water lines with rubber gasketed joints: 3.19 gallons per inch nominal diameter per mile of pipe per 24 hours while testing.

C. For meter run installation, when work cannot be isolated and line fails pressure test, visual inspection of work by Owner's Representative for leakage during pressure test may be used to fulfill requirements of this section.

3.4 CORRECTION FOR FAILED TESTS

A. Repair joints showing visible leaks on surface regardless of total leakage shown on test. Check valves and fittings to ensure that no leakage occurs that could affect or invalidate test. Remove cracked or defective pipes, fittings, and valves discovered during pressure test and replace with new items.

B. Owner's Representative may require failed lines to be disinfected after repair and prior to retesting. Conduct and pay for subsequent disinfection operations in accordance with requirements of Division 33. Pay for water required for additional disinfection and retesting.

C. Repeat test until satisfactory results are obtained.

3.5 COMPLETION

A. Upon satisfactory completion of testing, remove risers remaining from disinfection and hydrostatic testing, and backfill excavation promptly.

END OF SECTION 33 13 00.10

SECTION 33 31 00

SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gravity sanitary sewers and appurtenances, including stacks and service connections.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit proposed methods, equipment, materials and sequence of operations for sewer construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.

C. Test Reports: Submit test reports and inspection videos as specified in Part 3 of this Section. Video tapes become property of Owner.

1.4 QUALITY ASSURANCE

A. Qualifications. Install sanitary sewer that is watertight both in pipe-to-pipe joints and in pipe- to-manhole connections. Perform testing in accordance with Division 33.

B. Regulatory Requirements.

1. Install sewer lines to meet minimum separation distance from potable water line, as scheduled below. Separation distance is defined as distance between outside of water pipe and outside of sewer pipe. When possible, install new sanitary sewers no closer to water lines than 9 feet in all directions. Where this separation distance cannot be achieved, new sanitary sewers shall be installed as specified in this section.
2. Make notification to Owner's Representative when water lines are uncovered during sanitary sewer installation where minimum separation distance cannot be maintained.
3. Lay gravity sewer lines in straight alignment and grade.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Inspect pipe and fittings upon arrival of materials at job site.

B. Handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear or free fall. Do not drag pipe and fittings along ground. Do not roll pipe unrestrained from delivery trucks.

C. Use mechanical means to move or handle pipe. Employ acceptable clamps, rope or slings around outside barrel of pipe and fittings. Do not use hooks, bars, or other devices in contact with interior surface of pipe to lift or move lined pipe.

PART 2 PRODUCTS

2.1 PIPE

A. Provide piping materials for gravity sanitary sewers of sizes and types indicated on Drawings or as specified.

B. Reinforced concrete pipe is not acceptable.

2.2 PIPE MATERIAL SCHEDULE

A. Unless otherwise shown on Drawings, use pipe materials that conform to requirements specified in Division 33.

B. Where shown on Drawings, provide pipe meeting minimum class, dimension ratio, or other criteria indicated.

C. Pipe materials other than those listed above shall not be used for gravity sanitary sewers.

2.3 APPURTENANCES

A. Stacks. Conform to requirements of Division 33.

B. Service Connections. Conform to requirements of Division 33.

C. Roof, street or other type of surface water drains shall not be connected or reconnected into sanitary sewer lines.

2.4 BEDDING, BACKFILL, AND TOPSOIL MATERIAL

A. Bedding and Backfill: Conform to requirements of Division 31.

B. Topsoil: Conform to requirements of Division 32.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare traffic control plans and set up street detours and barricades in preparation for excavation when construction will affect traffic. Conform to requirements of Division 1.

B. Provide barricades, flashing warning lights, and warning signs for excavations. Conform to requirements of Division 1. Maintain barricades and warning lights where work is in progress or where traffic is affected by work.

C. Perform work in accordance with OSHA standards. Employ trench safety system as specified in Division 31 for excavations over 5 feet deep.

D. Immediately notify agency or company owning utility line which is damaged, broken or disturbed. Obtain approval from Owner's Representative and agency or utility company for repairs or relocations, either temporary or permanent.

E. Remove old pavements and structures including sidewalks and driveways in accordance with requirements of Division 2.

F. Install and operate dewatering and surface water control measures in accordance with Division 1.

G. Do not allow sand, debris or runoff to enter sewer system.

3.2 DIVERSION PUMPING

A. Install and operate required bulkheads, plugs, piping, and diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from Owner's Representative.

B. Design piping, joints and accessories to withstand twice maximum system pressure or 50 psi, whichever is greater.

C. No sewage shall be diverted into area outside of sanitary sewer.

D. In event of accidental spill or overflow, immediately stop overflow and take action to clean up and disinfect spillage. Promptly notify Owner's Representative so that required reporting can be made to Texas Natural Resources Conservation Commission and Environmental Protection Agency by Owner's Representative.

3.3 EXCAVATION

A. Earthwork. Conform to requirements of Division 31. Use bedding as indicated on Drawings.

B. Line and Grade. Establish required uniform line and grade in trench from benchmarks identified by Owner's Representative. Maintain this control for minimum of 100 feet behind and ahead of pipe-laying operation. Use laser beam equipment to establish and maintain proper line and grade of work. Use of appropriately sized grade boards which are substantially supported is also acceptable. Protect boards and location stakes from damage or dislocation.

C. Trench Excavation. Excavate pipe trenches to depths shown on Drawings and as specified in Division 31.

3.4 PIPE INSTALLATION BY OPEN CUT

A. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

B. Install pipe only after excavation is completed, bottom of trench fine graded, bedding material is installed, and trench has been approved by Owner's Representative.

C. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

D. Install pipe with spigot ends toward downstream end of flow such that water flows into bell and out the spigot.

E. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

F. Keep interior of pipe clean as installation progresses. Remove foreign material and debris from pipe.

G. Provide lubricant, place and drive home newly laid sections with come-a-long winches so as to eliminate damage to sections. Install pipe to "home" mark where provided. Use of back hoes or similar powered equipment will not be allowed unless protective measures are provided and approved in advance by Owner's Representative.

H. Keep excavations free of water during construction and until final inspection.

I. When work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

J. Where gravity sanitary sewer is to be installed under existing water line with separation distance of at least 2 feet and less than 9 feet, install new sewer pipe so that one

full18 foot long pipe is centered on water line crossing. Embed sewer pipe in cement stabilized sand for minimum distance of 9 feet on each side of crossing.

K. Where gravity sanitary sewer is to be installed under existing water line with separation distance of less than 2 feet, install new sewer using pressure-rated pipe as shown on Drawings. Maintain minimum 6-inch separation distance.

L. Where the length of the stub is not indicated, install the stub to the right-of-way line and seal the free end with an approved plug.

3.5 PIPE INSTALLATION OTHER THAN OPEN CUT

A. For installation of pipe by augering, jacking, or tunneling, conform to requirements of specification sections on tunneling augering, jacking and microtunneling work as appropriate.

3.6 INSTALLATION OF APPURTENANCES

A. Service Connections. Install service connections to conform to requirements of Division 33.

B. Stacks. Construct stacks to conform to requirements of Division 33.

C. Construct manholes to conform to requirements of Division 33 as applicable. Install frames, rings, and covers to conform to requirements of Division 33.

3.7 INSPECTION AND TESTING

A. Visual Inspection: Check pipe alignment in accordance with Division 33.

B. Mandrel Testing. Use Mandrel Test to test flexible pipe for deflection. Refer to Division 33.

C. Pipe Leakage Test. After backfilling line segment and prior to tie-in of service connections, visually inspect gravity sanitary sewers where feasible, and test for leakage in accordance with Division 33. Maintain piezometer installed to conform with Division 1 until acceptance testing is completed.

3.8 BACKFILL AND SITE CLEANUP

A. Backfill and compact soil in accordance with Division 31.

B. Backfill trench in specified lifts only after pipe installation is approved by Owner's Representative.

C. Repair and replace removed or damaged pavement, curbs, gutters, and sidewalks as specified in Division 32.

D. Provide hydromulch seeding in areas of commercial, industrial or undeveloped land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as indicated on Drawings. Provide minimum of 4 inches of topsoil and apply hydromulch according to requirements of Division 32.

E. Provide sodding in areas of residential land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as indicated on Drawings. Provide minimum of 4 inches of topsoil and sod disturbed areas in accordance with Division 32.

3.9 POST-INSTALLATION TELEVISION INSPECTION

A. Prior to final acceptance of newly constructed gravity sanitary sewers, perform cleaning and closed circuit television inspection. Cleaning shall include utilizing variable pressure water nozzles (3000 psi) and collection, removal, transportation and disposal of sand, debris, and liquid wastes to legal disposal sites.

B. Select and use closed-circuit television equipment that will produce color video tape.
Produce video tape using pan-and-tilt, radial viewing, pipe inspection camera that pans plus and minus 275 degrees and rotates 360 degrees. Use camera with accurate footage counter which displays on monitor exact distance of camera from starting manhole. Use camera with camera height adjustment so that camera lens is always centered at one-half inside diameter, or higher, in pipe being televised. Provide lighting system that allows features and condition of pipe to be clearly seen. Reflector in front of camera may be necessary to enhance lighting in dark or large diameter pipe.

C. Perform television inspection of gravity sanitary sewers as follows:

1. Videos shall pan beginning and ending manholes to demonstrate that debris has been removed. Camera operator shall slowly pan each service connection and where sewer transitions from one pipe material to another.
2. Video tapes shall be continuous for pipe segments between manholes. Do not leave gaps in video taping of segment between manholes and do not show single segment on more than one video tape.
3. No flow is allowed in gravity sanitary sewer while performing post-installation television inspection.

D. Provide video tapes on CD in a format compatible with Windows Media Player. Two labels are required. Place one label on the case and the other on face of each CD. Permanently label each video tape with following information.

Face of CD

Wastewater File No.: _____ Contractor's Name: _____
Inspection Type: [ ] Survey [ ] Pre-Installation [ ] Post-Installation
Tape No.:_____ Date Televised: _____ Date Submitted:
Basin No.: _____

CD Case

Manhole No. From	Manhole No. To	Pipe Diameter	Pipe Length	Street

E. For each video tape provide completed TV Inspection Report, as attached at end of this section. TV Inspection Report is written/narrated log of pipe conditions and service connections, indexed to footage counter.

F. Upon completion of video tape reviews by Owner's Representative, Contractor will be notified regarding final acceptance of sewer segment. **TELEVISION INSPECTION CODES**

HEADER INFORMATION

LOCATION

A STREET ROW, HEAVY TRAFFIC B STREET ROW, LIGHT TRAFFIC C EASEMENT, POOR ACCESS D EASEMENT, GOOD ACCESS E PARKING LOT, POOR ACCESS F PARKIGN LOT, GOOD ACCESS G ALLEY, POOR ACCESS H ALLEY, GOOD ACCESS I OPEN AREA, POOR ACCESS J OPEN AREA, GOOD ACCESS

SURFACE COVER

A ASPHALT STREET B CONCRETE STREET C SHELL STREET D SIDEWALK E TREES/SHRUBS F CLOSE TO FENCE G OPEN AREA H MOVABLE BUILDING I UNMOVABLE BUILDING J OVERHEAD UTILITIES K WATE RWAY OR RAILWAY L HIGHWAY OR RUNWAY M PIPE ABOVE GROUND

PIPE TYPE

ABS	ACRYLONITRILE BUTADIENE STYRENE
BRK	BRICK
CIP	CAST IRON PIPE
CMP	CORRUGATED METAL PIPE
CON	POURED IN PLACE CONCRETE
CPP	CURED IN PLACE PIPE
DIP	DUCTILE IRON PIPE
FRP	FIBERGLASS REINFORCED PIPE
PLP	PLASTIC LINE CONCRETE PIPE
PEP	POLYETHYLENE PIPE
PVC	POLYVINYLCHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RPM	REINFORCED PLASTIC MORTAR PIPE
RCP	REINFORCED CONCRETE PIPE
URC	UNREINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE

JOINTS

MJ - MISALIGNED JOINT BJ-BROKEN JOINT

CODES	DESCRIPTION	USE IN
A (3)	RP JT > 90% CLEAR	MJ
B (6)	DRP JT 80 - 90% CLEAR	MJ
C (9)	DRP JT < 80% CLEAR	MJ
D (3)	SHF JT > 90% CLEAR	MJ
E (6)	SHF JT 80 - 90% CLEAR	MJ
F (9)	SHF JT < 80% CLEAR	MJ
G (1)	WD JT 2” - 3”	MJ
H (2)	WD JT 3” - 4”	MJ
I (3)	WD JT > 4”	MJ
J (2)	BRK JT - LIGHT	BJ
K (4)	BRK JT - MEDIUM	BJ
L (6)	BRK JT - HEAVY	BJ
N (0)	VISIBLE GASKET	MJ
O (0)	LEAKING AT JOINT	MJ

LATERALS (L)

CODES	DESCRIPTION
A (1)	PRT SER 0” - 1”
B (2)	PRT SER 1” - 2”
C (3)	PRY SER 2” - 3”
D (4)	PRT SER 3” +
E (5)	EFECTI E - SERVICE CONN.
F (6)	DEAD/UNUSED SERVICE
G (7)	FACTORY SERVICE
H (0)	PLUMBER SERVICE

ROOTS (R)

CODES	DESCRIPTION
A (1)	ROOTS - LIGHT
B (2)	ROOTS - MEDIUM
C (3)	ROOTS - HEAVY

DEBRIS (D)

CODES	DESCRIPTION
A	DEBRIS - LIGHT
B	DEBRIS - MEDIUM
C	DEBRIS - HEAVY
D	GREASE - LIGHT
E	GREASE - MEDIUM
F	GREASE - HEAVY

INFLOW/INFILTRATION (I)

CODES	DESCRIPTION
A (3)	I/I - LIGHT (0-1 GPM)
B (6)	I/I - MEDIUM (1-5 GPM)
C (9)	I/I - HEAVY (> 5 GPM)
D (2)	I/I - SOME EVIDENCE
E (4)	I/I - CONSIDERABLE EVIDENCE
F (6)	I/I - GREAT EVIDENCE
G (0)	I/I - NO EVIDENCE

ALIGNMENT (A)

WEATHER
DRY - WET

CODE DESCRIPTIONS

CRACKS

RC-RADIAL LC-LONGITUDINAL

CODES	DESCRIPTION	USE IN
A (1)	< /" W, 1' L	CRK
B (2)	< /" W, 1' - 2' L	CRK
C (3)	< /" W, >2' L	CRK
D (4)	> /" W, < 1' L	CRK
E (5)	> /" W, 1' - 2' L	CRK
F (6)	> /" W, > 2' L	CRK
G (7)	HOLE IN PIPE - SMALL	
H (8)	PIPE MISSING - < 60°	
I (9)	PIPE MISSING - > 60°	

CODES	DESCRIPTION
A	BEGIN % PIPE WATER
B	BEGIN / PIPE WATER
C	CAMERA UNDERWATER
D	END CAMERA UNDERWATER
E	END / PIPE WATER
F	END % PIPE WATER

STRUCTURAL

DS-DETERIORATED; OS-OVALITY; CS COLLAPSED

CODES	DESCRIPTION	USE
A (3)	LINE DET - LIGHT	DS
B (6)	LINE DET - MEDIUM	DS
C (9)	LINE DET - HEAVY	DS
D (3)	OVAL < 5%	OS
E (6)	OVAL > 5% & < 10%	OS
F (9)	OVAL > 10%	OS
G (9)	COLLAPSED	CS
H (0)	PIPE DET - HEAVY	DS
L (0)	PIPE DET - LIGHT	DS
M (0)	PIPE - MEDIUM	DS
N (0)	PIPE DET - NONE	DS
O	LINE DET - NONE	DS
Z (0)	AT MANHOLE NUMBER	CS

END OF SECTION 33 31 00

SECTION 33 31 00.10

ACCEPTANCE TESTING FOR SANITARY SEWERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acceptance testing of sanitary sewers including:
   1. Visual inspection of sewer pipes.
   2. Mandrel testing for flexible sewer pipes.
   3. Leakage testing of sewer pipes.
   4. Leakage testing of manholes.
   5. Smoke testing of point repairs.
   6. All tests listed in this Section are not necessarily required on this Project. Required tests are named in other Sections which refer to this Section for testing criteria and procedures.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. ASTM C 828 - Standard Test Method for Low Pressure Air Test of Vitrified Clay Pipe Lines.

B. ASTM C 924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

C. ASTM D 3034 - Standard Specification for Type PSM Polyethylene (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

D. ASTM F 794 - Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

E. ASTM F 1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity flow sanitary sewers are required to have straight alignment and uniform grade between manholes.

B. Flexible pipe, including "semi-rigid" pipe, is required to show no more than 5 percent deflection. Test pipe no sooner than 30 days after backfilling of line segment but prior to final acceptance using standard mandrel to verify that installed pipe is within specified deflection tolerances.

C. Maximum allowable leakage for Infiltration or Exfiltration.

   1. The total exfiltration, as determined by hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at minimum test head of 2 feet above crown of pipe at upstream manhole or 2 feet above groundwater elevation, whichever is greater.
   2. When pipes are installed more than 2 feet below groundwater level, use infiltration test in lieu of exfiltration test. Total infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours. Groundwater elevation must be at least 2 feet above crown of pipe at upstream

manhole.

3. Refer to Table 33 31 00.10-1, Water Test Allowable Leakage, at end of Section, for measuring leakage in sewers. Perform leakage testing to verify that leakage criteria are met.

D. Perform air testing in accordance with requirements of this Section and Texas Natural Resources Conservation Commission requirements. Refer to Table 33 31 00.10-2, Time Allowed for Pressure Loss from 3.5 psig to 2.5 psig, Table 33 31 00.10-3, Minimum Testing Times for Low Pressure Air Test, and Table 33 31 00.10-4, Vacuum Test Time Table, at end of this Section.

1.5 SUBMITTALS

A. Conform to requirements of Division 1.

B. Test Plan: Before testing begins and in adequate time to obtain approval through submittal process, prepare and submit test plan for approval by Owner's Representative. Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from Drawings and Specifications.

C. Test Reports: Submit test reports for each test on each segment of sanitary sewer.

1.6 GRAVITY SANITARY SEWER QUALITY ASSURANCE

A. Repair, correct, and retest manholes or sections of pipe which fail to meet specified requirements when tested.

B. Provide testing reports and video tape of television inspection as directed by Owner's Representative.

C. Upon completion of tape reviews by Owner's Representative, Contractor will be notified regarding final acceptance of sewer segment.

1.7 SEQUENCING AND SCHEDULING

A. Perform testing as work progresses. Schedule testing so that no more than 1000 linear feet of installed sewer remains untested at one time.

B. Coordinate testing schedules with Owner's Representative. Perform testing under observation of Owner's Representative.

PART 2 PRODUCTS

2.1 DEFLECTION MANDREL

A. Mandrel Sizing. Rigid mandrel shall have outside diameter (O.D.) equal to 95 percent of inside diameter (I.D.) of pipe. Inside diameter of pipe, for purpose of determining outside diameter of mandrel, shall be average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and average inside diameter for I.D. controlled pipe, dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

B. Mandrel Design. Rigid mandrel shall be constructed of metal or rigid plastic material that can withstand 200 psi without being deformed. Mandrel shall have nine or more "runners" or "legs" as long as total number of legs is odd number. Barrel section of mandrel shall have length of at least 75 percent of inside diameter of pipe. Rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing. Provide and use proving ring for modifying each size mandrel.

C. Proving Ring. Furnish "proving ring" with each mandrel. Fabricate ring of 1/2-inch-thick, 3- inch-wide bar steel to diameter 0.02 inches larger than approved mandrel diameter.

D. Mandrel Dimensions (5 percent allowance). Average inside diameter and minimum mandrel diameter

are specified in Table 30 31 00.10-5, Pipe vs. Mandrel Diameter, at end of this Section. Mandrels for higher strength, thicker wall pipe or other pipe not listed in table may be used when approved by Owner's Representative.

2.2 EXFILTRATION TEST

A. Water Meter: Obtain transient water meter from appropriate governmental agency for use when water for testing will be taken from public system. Conform to governmental agency requirements for water meter use.

B. Test Equipment:

1. Pipe plugs.
2. Pipe risers where manhole cone is less than 2 feet above highest point in pipe or service lead.

2.3 INFILTRATION TEST A. Test Equipment:

1. Calibrated 90 degree V-notch weir.
2. Pipe plugs.

2.4 LOW PRESSURE AIR TEST

A. Minimum Requirement for Equipment:
1. Control panel.
2. Low-pressure air supply connected to control panel.
3. Pneumatic plugs: Acceptable size for diameter of pipe to be tested; capable of withstanding internal test pressure without leaking or requiring external bracing.
4. Air hoses from control panel to:
   a. Air supply.
   b. Pneumatic plugs.
   c. Sealed line for pressuring.
   d. Sealed line for monitoring internal pressure.

B. Testing Pneumatic Plugs: Place pneumatic plug in each end of length of pipe on ground. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5 psig. Plugs are acceptable when they remain in place against test pressure without external aids.

2.5 GROUND WATER DETERMINATION

A. Equipment: Pipe probe or small diameter casing for ground water elevation determination.

2.6 SMOKE TESTING A. Equipment:

1. Pneumatic plugs.
2. Smoke generator as supplied by Superior Signal Company, or approved equal.
3. Blowers producing 2500 scfm minimum.

PART 3 EXECUTION

3.1 PREPARATION

A. Provide labor, equipment, tools, test plugs, risers, air compressor, air hose, pressure meters, pipe probe, calibrated weirs, or any other device necessary for proper testing and inspection.

B. Determine selection of test methods and pressures for gravity sanitary sewers based on ground water elevation. Determine ground water elevation using equipment and procedures conforming to Division

1.

3.2 VISUAL INSPECTION OF GRAVITY SANITARY SEWERS

A. Check pipe alignment visually by flashing light between structures. Verify if alignment is true and no pipes are misplaced. In case of misalignment or damaged pipe, remove and re-lay or replace pipe segment.

3.3 MANDREL TESTING FOR GRAVITY SANITARY SEWERS

A. Perform deflection testing on flexible and semi-rigid pipe to confirm pipe has no more than 5 percent deflection. Mandrel testing shall conform to ASTM D 3034. Perform testing no sooner than 30 days after backfilling of line segment, but prior to final acceptance testing of line segment.

B. Pull approved mandrel by hand through sewer sections. Replace any section of sewer not passing mandrel. Mandrel testing is not required for stubs.

C. Retest repaired or replaced sewer sections.

3.4 LEAKAGE TESTING FOR GRAVITY SANITARY SEWERS

A. Test Options:
1. Test gravity sanitary sewer pipes for leakage by either exfiltration or infiltration methods, as appropriate, or with low pressure air testing.
2. Test new or rehabilitated sanitary sewer manholes with water or low pressure air. Manholes tested with low pressure air shall undergo physical inspection prior to testing.
3. Perform leakage testing after backfilling of line segment, and prior to tie-in of service connections.
4. If no installed piezometer is within 500 feet of sewer segment, provide temporary piezometer for this purpose.

B. Compensating for Ground Water Pressure:
1. Where ground water exists, install pipe nipple at same time sewer line is placed. Use 1/2-inch capped pipe nipple approximately 10 inches long. Make installation through manhole wall on top of sewer line where line enters manhole.
2. Immediately before performing line acceptance test, remove cap, clear pipe nipple with air pressure, and connect clear plastic tube to nipple. Support tube vertically and allow water to rise in tube. After water stops rising, measure height in feet of water over invert of pipe. Divide this height by 2.3 feet/psi to determine ground water pressure to be used in line testing.

C. Exfiltration test:

1. Determine ground water elevation.
2. Plug sewer in downstream manhole.
3. Plug incoming pipes in upstream manhole.
4. Install riser pipe in outgoing pipe of upstream manhole when highest point in service lead (house service) is less than 2 feet below bottom of manhole cone.
5. Fill sewer pipe and manhole or pipe riser, when used, with water to point 2-1/2 feet above highest point in sewer pipe, house lead, or ground water table, whichever is highest.
6. Allow water to stabilize for one to two hours. Take water level reading to determine drop of water surface, in inches, over one-hour period, and calculate water loss (1 inch of water in 4 feet diameter manhole equals 8.22 gallons) or measure quantity of water required to keep water at same level. Loss shall not exceed that calculated from allowable leakage according to Table 33 31 00.10-1 at end of this Section.

D. Infiltration test: Ground water elevation must be not less than 2.0 feet above highest point of sewer pipe or service lead (house service).

1. Determine ground water elevation.
2. Plug incoming pipes in upstream manhole.
3. Insert calibrated 90 degree V-notch weir in pipe on downstream manhole.
4. Allow water to rise and flow over weir until it stabilizes.
5. Take five readings of accumulated volume over period of 2 hours and use average for infiltration. Average must not exceed that calculated for 2 hours from allowable leakage according to Table 33 31 00.10-1 at end of this Section.

E. Low Air Pressure Test: When using this test conform to ASTM C 828, ASTM C 924, or ASTM F 1417, as applicable, with holding time not less than that listed in Table 33 01 30-2.

1. Air testing for sections of pipe shall be limited to lines less than 36-inch average inside diameter.
2. Lines 36-inch average inside diameter and larger shall be tested at each joint. Minimum time allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch during joint test shall be 10 seconds, regardless of pipe size.
3. For pipe sections less than 36-inch average inside diameter:
   a. Determine ground water level.
   b. Plug both ends of pipe. For concrete pipe, flood pipe and allow 2 hours to saturate concrete. Then drain and plug concrete pipe.
   c. After manhole-to-manhole section of sanitary sewer main has been sliplined and prior to any service lines being connected to new liner, plug liner at each manhole with pneumatic plugs.
   d. Pressurize pipe to 4.0 psig. Increase pressure 1.0 psi for each 2.3 feet of ground water over highest point in system. Allow pressure to stabilize for 2 to 4 minutes. Adjust pressure to start at 3.5 psig (plus adjustment for ground water table). See Table 33 31 00.10-2 at end of this Section.
   e. To determine air loss, measure time interval for pressure to drop to 2.5 psig. Time must exceed that listed in Table 33 31 00.10-2 at end of this Section for pipe diameter and length. For sliplining, use diameter of carrier pipe.

F. Retest: Repair and retest any section of pipe which fails to meet requirements.

3.5 TEST CRITERIA TABLES

A. Exfiltration and Infiltration Water Tests: Refer to Table 33 31 00.10-1, Water Test Allowable Leakage, at end of this Section.

B. Low Pressure Air Test:

1. Times in Table 33 31 00.10-2, Time Allowed For Pressure Loss From 3.5 psig to 2.5 psig, at end of this Section, are based on equation from Texas Natural Resources and Conservation Commission (TNRCC) Design Criteria 317.2(a)(4)(B).

		T = 0.0850(D)(K)/(Q)
Where:	T =	Time for pressure to drop 1.0 pounds per square inch gauge in seconds
	K =	0.000419 DL, but not less than 1.0
	D =	Average inside diameter in inches
	L =	Length of line of same pipe size in feet
	Q =	Rate of loss, 0.0015 ff**7**min./sq. ft. internal surface

2. Since K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as given in Table 33 31 00.10-3, Minimum Testing Times for Low Pressure Air Test.

Notes:

1. When two sizes of pipe are involved, compute time by ratio of lengths involved.
2. Lines with 27-inch average inside diameter and larger may be air tested at each joint.
3. Lines with average inside diameter greater than 36 inches must be air tested for leakage at each joint.
4. If joint test is used, perform visual inspection of joint immediately after testing.
5. For joint test, pipe is to be pressurized to 3.5 psi greater than pressure exerted by groundwater above pipe. Once pressure has stabilized, minimum times allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

3.6 LEAKAGE TESTING FOR MANHOLES

A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.

B. Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged when lines entering manhole have not been backfilled.

C. Vacuum testing:

1. Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to recommended maximum inflation pressure; do not over-inflate.
2. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for time period specified in Table 33 31 00.10-4, Vacuum Test Time Table.
3. If drop in vacuum exceeds 1 inch Hg over specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

D. Perform hydrostatic exfiltration testing as follows:

1. Seal wastewater lines coming into manhole with internal pipe plug. Then fill manhole with water and maintain it full for at least one hour.
2. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.
3. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

3.7 SMOKE TEST PROCEDURE FOR POINT REPAIRS

A. Application: Perform smoke test to:

1. Locate points of line failure for point repair.
2. Determine when point repairs are properly made.
3. Determine when service connections have been reconnected to rehabilitated sewer.
4. Check integrity of connections to newly replaced service taps to liners and to existing private service connections.

B. Limitations: Do not backfill service taps until completion of this test. Test only those taps in single manhole section at one time. Keep number of open excavations to minimum.

C. Preparation: Prior to smoke testing, give written notices to area residents no fewer than 2 days, nor more than 7 days, prior to proposed testing. Also give notice to Police and Fire Departments 24 hours

prior to actual smoke testing.

D. Isolate Section: Isolate manhole section to be tested from adjacent manhole sections to keep smoke localized. Temporarily seal annular space at manhole for sliplined sections.

E. Smoke Introduction:

1. Operate equipment according to manufacturer's recommendation and as approved by Owner's Representative.
2. Conduct test by forcing smoke from smoke generators through sanitary sewer main and service connections. Operate smoke generators for minimum of 5 minutes.
3. Introduce smoke into upstream and downstream manhole as appropriate. Monitor tap/connection for smoke leaks. Note sources of leaks.

F. Repair and Retest: Repair and replace taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one manhole section at time. When repair or replacement, testing or retesting, and backfilling of excavation is not completed within one work day, properly barricade and cover each excavation as approved by Owner's Representative.Service Connections: On houses where smoke does not issue from plumbing vent stacks to confirm reconnection of sewer service to newly installed liner pipe, perform dye test to confirm reconnection. Introduce dye into service line through plumbing fixture inside structure or sewer cleanout immediately outside structure and flush with water. Observe flow at service reconnection or downstream manhole. Detection of dye confirms reconnection.

WATER TEST ALLOWABLE LEAKAGE
Table 33 31 00.10-1

DIAMETER OF RISER OR STACK IN INCHES	VOLUME PER INCH OF DEPTH		ALLOWANCE LEAKAGE1	
	INCH	GALLONS	PIPE SIZE IN INCHES	GALLONS/MINUTE PER 100 FEET
1	0.7854	.0034	6	0.0039
2	3.1416	.0136	8	0.0053
2.5	4.9087	.0212	13	0.0066
3	7.0686	.0306	12	0.0079
4	12.5664	.0306	15	0.0099
5	19.6350	.0544	18	0.0118
6	28.2743	.1224	21	0.0138
8	50.2655	.2176	24	0.0158
			27	0.0177
			30	0.0197
			36	0.0237
			42	0.0276
For other diameters, multiply square of diameters by value for 1" diameter.			Equivalent to 50 gallons per inch of inside diameter per mile per 24 hours.	

Allowable leakage rate shall be reduced to 10 gallons per inch of inside diameter per mile per 24 hours, when sewes identified as located within 25-year flood plain.

1Add T times for each additional 2-foot depth.
(The values listed above have been extrapolated from ASTM C 924-85)

Table 33 31 00.10-2
ACCEPTANCE TESTING FOR SANITARY SEWERS

TIME ALLOWED FOR PRESSURE LOSS FROM 3.5 PSIG TO 2.5 PSIG														
Pipe Diam. (in.)	Min. Time	Length For Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)										
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	500 ft	550 ft	600 ft
6	5:40	398	0.854	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.519	7:33	7:33	7:33	7:33	7:36	8:52	10:08	11:24	12:40	13:56	15:12
10	9:27	239	2.374	9:27	9:27	9:27	9:54	11:52	13:51	15:50	17:48	19:47	21:46	23:45
12	11:20	199	3.419	11:20	11:20	11:20	14:15	17:06	19:57	22:48	25:39	28:30	31:20	34:11
15	14:10	159	5.342	14:10	14:10	17:48	22:16	26:43	31:10	35:37	40:04	44:31	48:58	53:25
18	17:00	133	7.692	17:00	19:14	25:39	32:03	38:28	44:52	51:17	57:42	64:06	70:31	76:56
21	19:50	114	10.470	19:50	26:11	35:54	43:38	52:21	61:05	69:48	78:32	87:15	95:59	104:42
24	22:40	99	13.676	22:48	34:11	45:35	56:59	68:23	79:47	91:10	102:34	113:58	125:22	136:46
27	25:30	88	17.308	28:51	43:16	57:42	72:07	86:33	100:58	115:24	129:49	144:14	158:40	173:05
30	28:20	80	21.369	35:37	53:25	71:14	89:02	106:51	124:39	142:28	160:16	178:05	195:53	213:41
33	31:10	72	25.856	43:06	64.38	86:11	107:44	129:17	150:50	172:23	193:55	215:28	237:01	258:34

Table 33 31 00.10-3
MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST

Pipe Diameter (inches)	Minimum Time (seconds)	Length for Minimum Time (feet)	Time for Longer Length (seconds)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	100	13.676 (L)
27	1530	88	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	25.856 (L)

Table 33 31 00.10-4 VACUUM TEST TIME TABLE

DEPTH IN FEET	TIME IN SECONDS BY PIPE DIAMETER		
	48”	60”	72”
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96
	5.0	6.5	8.0

Table 33 31 00.10-5 PIPE VS. MANDREL DIAMETER

Material and Wall Construction	Nominal Size (Inches)	Average I.D. (Inches	Minimum Mandrel Diameter (Inches)
PVC-Solid (SDR 26)	6	5.764	5.476
	8	7.715	7.329
	10	9.646	9.162
PVC-Solid (SDR 35)	12	11.737	11.150
	15	14.374	13.655
	18	17.629	16.748
	21	20.783	19.744
	24	23.381	22.120
	27	26.351	25.033
PVC-Truss	8	7.750	7.363
	10	9.750	9.263
	12	11.790	11.201
	15	14.770	14.032
PVC-Profile (ASTM F 794)	12	11.740	11.153
	15	14.370	13.652
	18	17.650	16.768
	21	20.750	19.713
	24	23.500	22.325
	27	26.500	25.175
	30	29.500	28.025
	36	35.500	33.725
	42	41.500	39.425
	48	47.500	45.125
HDPE-Profile	18	18.000	17.100
	21	21.000	19.950
	24	24.000	22.800
	27	27.000	25.650
	30	30.000	28.500
	36	36.000	34.200
	42	42.000	39.900
	48	48.000	45.600
	54	54.000	51.300
	60	60.000	57.000
Fiberglass (Class SN 46)	12	12.85	11.822
	18	18.66	17.727
	20	20.68	19.646
	24	24.72	23.484
	30	30.68	29.146
	36	36.74	34.903
	42	42.70	40.565
	48	48.76	46.322
	54	54.82	52.079
	60	60.38	57.361

END OF SECTION 33 31 00.10

SECTION 33 41 00

STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. New storm sewers and appurtenances, modifications to existing storm sewer system and installation of roadside ditch culverts.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit manufacturer's literature for product specifications and installation instructions.

C. Submit proposed methods, equipment, materials, and sequence of operations for sewer construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.

1.4 QUALITY ASSURANCE

A. The Condition for acceptance shall be watertight storm sewer that is watertight both in pipe-to-pipe joints and in pipe-to-manhole connections.

B. Provide manufacturer's certification to Specifications.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations.

B. Handle pipe, fittings, and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks or trailers. Do not use Materials cracked, gouged, chipped, dented, or otherwise damaged shall not be use materials for installation.

C. Store pipe and fittings on heavy timbers or platforms toavoid contact with ground.

D. Unload pipe, fittings, and appurtenances as close as practical to locationof installation to avoid unnecessary handling.

E. Keep interiors of pipe and fittings free of dirt and foreign matter.

F. Store PVC pipe out of direct sunlight.

PART 2 PRODUCTS

2.1 PIPE

A. Provide piping materials for storm sewers shall be of sizes and types specified unless otherwise indicated on Drawings.

B. In diameters where material alternatives are available, provide pipe from single manufacturer for each pipe diameter, unless otherwise approved by Owner's Representative or otherwise shown on Drawings.

C. Existing pipe that has been removed during construction cannot be reused.

2.2 PIPE MATERIAL SCHEDULE

A. Storm Sewer Pipe: Use pipe materials that conforming to requirements specified in Division 33 and as shown on the Drawings.

B. Driveway Culvert Pipe for Streets with Open Ditches: Use pipe materials that conforming to requirements specified Division 33 and as shown on the Drawings.

C. Provide pipe meeting minimum class, dimension ratio, or other criteria indicated.

D. Pipe materials other than those listed above shall not be used for storm sewers.

2.3 BEDDING, BACKFILL, AND TOPSOIL MATERIAL

A. Bedding and Backfill Material: Conform to requirements of Division 31.

B. Topsoil: Conform to requirements of Division 32.

C. Use cement stabilized sand material for bedding and backfill in the pipe zone for all storm sewers.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare traffic control plans and set up street detours and barricades in preparation for excavation when construction will affects traffic. Conform to requirements of Division 1.

B. Provide barricades, flashing warning lights, and signs for excavations. Conform to requirements of Division 1. Maintain barricades and warning lights for streets and intersections while Work is in progress or where traffic is affected by Work.

C. Immediately notify agency or company owning utility lines which are damaged, broken, or disturbed. Obtain approval from Owner's Representative and agency for repairs or relocations, either temporary or permanent.

D. Remove old pavements and structures, including sidewalks and driveways in accordance with requirements of Division 2.

E. Install and operate dewatering and surface water control measures in accordance with Division 1.

3.2 EXCAVATION

A. Earthwork. Conform to requirements of Division 31. Use bedding as indicated on Drawings.

B. Line and Grade. Establish required uniform line and grade trench from benchmarks identified by Owner's Representative. Maintain this control for minimum of 100 feet behind and ahead of pipe-laying operation. Use laser beam equipment to establish and maintain proper line and grade of Work. Or use of appropriately sized grade boards which are substantially supported.

C. Trench Excavation. Excavate pipe trenches to level as indicated on Standard Details. Backfill excavation with specified bedding material to level of lower one-third of pipe barrel. Tamp and compact backfill to provide bedding at indicated grade. Form bedding foundation to minimum depth of one-eighth of pipe diameter, but not less than 6 inches.

3.3 PIPE INSTALLATION

A. Install in accordance with pipe manufacturer's recommendations and as specified in this section.

B. Install pipe only after excavation is completed, bottom of trench is shaped, bedding material is installed, and trench has been approved by Owner's Representative.

C. Install pipe to line and grade indicated on Drawings. Place pipe so that it has continuous bearing of barrel on bedding material with no voids, and is laid in trench so interior surfaces of pipe follows grades and alignments indicated.

D. Install pipe with bells of pipe facing upstream of anticipated flow.

E. Form concentric joint with each section of adjoining pipe to prevent offsets.

F. Place and drive home newly laid sections with a sling or come-a-long winches to eliminate damage to sections. Unless otherwise approved by Owner's Representative, provide end protection to prevent damage while using back hoes or similar powered equipment to drive home newly laid sections.

G. Keep interior of pipe clean as installation progresses.

H. Keep excavations free of water during construction and until final inspection.

I. When work is not in progress, cover exposed ends of pipes with pipe plug specifically designed to prevent foreign material from entering pipe.

J. For PVC Pipe:

1. Provide a minimum cover as per manufacturer's requirements from top of pavement to top of pipe, but no less than 2 feet.
2. Accomplish transitions to different material of pipe in a manhole or inlet box. No adapter, coupling for dissimilar pipe, or saddle connections allowed.
3. Provide pipe sections in standard lengths with minimum length of 13 feet. Pipe may be field modified to shorten length no less than 4 feet, unless otherwise approved by Owner's Representative. Field modify pipe per manufacturer's recommendations.
4. No beveling at joint allowed. Cut to be perpendicular to longitudinal axis.
5. Provide gasketed bell and spigot joints installed per manufacturer's recommendations. Gasketed pipe joints; clean and free of debris, show no leakage after installation.

3.4 PIPE INSTALLATION OTHER THAN OPEN CUT

A. Conform to requirements of Division 33 where required.

B. Not allowed for plastic sewer pipe.

3.5 INSTALLATION OF APPURTENANCES

A. Construct manholes to conform to requirements of Division 33. Install frames, grate rings, and covers to conform to requirements of Division 33.

B. Install PVC pipe culverts with approved end treatments. Approved end treatments include concrete headwalls, wingwalls and collars.

C. Install inlets, headwalls, and wingwalls to conform to requirements of Division 33.

D. Rehabilitate existing manholes to conform to requirements of Division 33. Adjust manhole covers and inlets to grade conforming to requirements of Division 33.

E. Dimension for Type C and Type E manholes shall be as shown on Drawings.

3.6 INSPECTION AND TESTING

A. Perform post installation television inspection in accordance with Division 33. Hand held cameras may be used in storm sewers in lieu of requirements Division 33. Clearly stencil distance markings on each joint of pipe to indicate distance from starting manhole when using hand held cameras.

3.7 BACKFILL AND SITE CLEANUP

A. Backfill trench after pipe installation is inspected and approved by Owner's Representative.

B. Backfill and compact soil in accordance with Division 31.

C. Repair and replace removed or damaged pavement and sidewalks as specified in Division 32.

D. In unpaved areas, grade surface as uniform slope to natural grade as indicated on Drawings. Provide minimum of 4 inches of topsoil and seed according to requirements of Division 32 as required.

END OF SECTION 33 41 00

SECTION 33 49 13

STORM DRAINAGE MANHOLES, FRAMES AND COVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Iron castings for manhole frames and covers, inlet frames and grates, catch basin frames and grates, meter vault frames and covers, adjustment rings, and extensions.

B. Ring grates.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). Contract is a Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.3 REFERENCES

A. AASHTO -American Association of State Highway and Transportation Officials Standard Specification for Highway Bridges

B. ASTM A 48 -Standard Specification for Gray Iron Castings

C. ASTM A 615 -Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

D. AWS -D 12.1 Welding Reinforcing Steel.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions.

C. Submit shop drawings for fabrication and installation of casting assemblies that are not included in Drawings or standard City details. Include plans, elevations, sections and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.

PART 2 PRODUCTS

2.1 CASTINGS

A. Use castings for frames, grates, rings and covers conforming to ASTM A 48, Class 35B. Provide locking covers if indicated on Drawings.

B. Use clean castings capable of withstanding application of AASHTO M306-40,000 pound proof loading without detrimental permanent deformation.

C. Fabricate castings to conform to shapes, dimensions, and with wording or logos shown on Drawings. Standard dimensions for manhole covers are 32 inches in diameter.

D. Use clean castings, free from blowholes and other surface imperfections. Use clean and symmetrical cast holes in covers, free of plugs.

2.2 BEARING SURFACES

A. Machine bearing surfaces between covers or grates and their respective frames so that even bearing is provided for position in which casting may be seated in frame.

2.3 SPECIAL FRAMES AND COVERS

A. Where indicated on Drawings, provide watertight manhole frames and covers with minimum of four bolts and gasket designed to seal cover to frame. Supply approved watertight manhole covers and frames.

B. Where shown on Drawing, provide manhole frames and covers with 48 inch diameter clear opening, with inner cover for 22 inch diameter clear opening. Provide approved inner cover with pattern shown on Drawings.

2.4 FINISH

A. Unless otherwise specified, uncoated cast iron.

2.5 FABRICATED RING GRATE

A. Fabricate ring grates from reinforcing steel conforming to ASTM A 615.

B. Conform to welds connecting bars to AWS D 12.1.

2.6 ADJUSTMENT RINGS FOR ASPHALT OVERLAYS

A. Use castings conforming to Division 33 requirements.

B. One piece casting with dimensions to fit frame and cover.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install castings according to approved shop drawings, instructions in related specifications, and applicable directions from manufacturer's printed materials.

B. Set castings accurately at required locations to proper alignment and elevation. Keep castings plumb, level, true, and free of rack. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.

C. Fabricate ring grates in accordance with City of Houston standard detail, "Ring Grate for Open End of 18 Inch to 72 Inch Stubs to Ditch". Set in mortar in mouth of pipe bell.

D. Install adjustment rings in existing frames with clean bearing surfaces that are free from rocking.

END OF SECTION 33 49 13


VLK